2021 Annual Interpretive Report

Naval Communication Station Harold E Holt Area A - PFAS OMP

DEF19009

Prepared for
Department of Defence

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now
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Executive Summary

Introduction

Cardno, now Stantec, were engaged by the Australian Department of Defence ("the Client") to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP)[1] at the Naval Communication Station Harold E Holt – Area A, Western Australia ('HEH-A' or the 'site'), Western Australia.

The Ongoing Monitoring Plan (OMP) outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater, surface water, seepage water and sediment originating from HEH-A. The monitoring program consists of biannual monitoring events in November and June, as well a 'first flush' monitoring event following the first heavy rainfall of the wet season (usually between February and April). A first flush event is important to monitor as it is when PFAS concentrations are typically higher than they would be measured at other times of the year, due to the build-up of PFAS over the dry season.

The OMP includes sampling and analysis not only from the site, but also from a number of surrounding (off-site) waterways. The site and these surrounding areas are collectively referred to as the 'Management Area' and was identified during a Detailed Site Investigation in 2018 (GHD, 2018)[2]. The Management Area is shown on Figure 2, Appendix A) of this report.

Objectives

The objectives of the monitoring specified in the OMP are to:

- Evaluate the nature and extent (spatial and temporal) of PFAS impact in groundwater and surface water pathways associated with site sources of PFAS derived from historical use of Aqueous Film-Forming Foam (AFFF);
- Monitor the migration of PFAS in groundwater and surface water from the site;
- Provide confirmation of the current understanding of risk; and
- Provide supporting data for assessment of management actions, where relevant.

Monitoring Scope

The November 2020 – June 2021 monitoring period comprised three monitoring events (November 2020, first flush undertaken in March 2021, and June 2021). The scope of work for the biannual monitoring events comprised monitoring of 31 groundwater wells, 11 water seepage locations and six co-located sediment and surface water locations, as specified in the OMP. The first flush event, conducted in March 2021, comprised the monitoring of six sediment and surface water locations following the first heavy rainfall of the wet season.

Groundwater elevation data was collected from 31 groundwater wells during the biannual monitoring events.

Works were conducted in general accordance with the Sampling and Analysis Quality Plan (SAQP) (Cardno, 2021), except as summarised in Section 3.6 of this report.

The current monitoring network is considered adequate to monitor PFAS in groundwater, surface water runoff and sediment, and to provide an early detection of significant changes in migration.

Groundwater Results

Groundwater Flow Direction

Groundwater flow direction is consistent between the two biannual events of the reporting period, indicating an outward flow direction from the sand dunes east of site, where mounding is occurring. Mounding is when water enters the ground quicker than it can move horizontally underground. This leaves an underground 'hill' of water that is constantly flowing outwards. The flow directions are consistent with the previous monitoring events.

[1] The OMP is publically available at www.defence.gov.au/Environment/PFAS/lharoldeholt, and is found as Attachment 1 of the PFAS Management Area Plan
[2] Publically available at www.defence.gov.au/Environment/PFAS/haroldeholt

What is an 'order of magnitude'?

This refers to something decreasing or increasing by multiples of ten. For instance, an increase from 10 to 100 is an order of magnitude increase. When assessing changes in PFAS concentrations at an individual location, all concentrations are considered when determining trends, but order of magnitude changes are discussed separately as they represent a significant change in concentrations from what was reported in the previous event.

If a change is close to established health or environmental criteria, it will also be considered significant.

Groundwater elevations can also be influenced by ocean tides in some locations near to the coastline. This has been considered when monitoring (i.e. wells preferably gauged during outgoing tides when groundwater levels would be least influenced by tides) and interpreting the groundwater elevation and flow direction.

PFAS Concentrations

The groundwater results recorded during the reporting period remained within the same order of magnitude as historical data. No first time detects of perfluorooctanoic acid (PFOA) or Sum of perfluorooctane sulfonate (PFOS) and perfluorohexane sulphonate (PFHxS), or new exceedance of adopted guidelines were recorded for the groundwater monitoring locations during the reporting period.

PFAS concentrations were graphed over time and interpreted for all groundwater monitoring locations. Trend analysis showed that the PFAS plume was generally stable or showed no statistically significant trend. This means there is no observed increasing or decreasing trend in the measurements at this time.

Notable exceptions to the above are:

- Three groundwater locations across the source areas (MW008 and MW105 in the POL Storage Area and MW017 in the Powerhouse Area) showed a decreasing trend for either PFOS, PFOA or sum of PFOS and PFHxS.
- Two groundwater monitoring wells (MW003 MW119 in the POL Storage Area) reported concentrations for the sum of PFOS and PFHxS above the HEPA (2020) recreational use criteria. A review of historical concentrations indicates that the concentrations are consistently above HEPA (2020) but are not increasing or decreasing over time.

None of the source area groundwater monitoring locations show a potential increasing trend. This, in conjunction with the decreasing or stable trends observed indicates that the PFAS source areas are not adding to the PFAS that is already in the groundwater. The plume appears to be slowly diluted with rainfall recharge and groundwater migration. However, given the ongoing exceedances of adopted ecological and human health guidelines, ongoing monitoring should be continued to confirm these preliminary observations.

What is a 'limit of reporting'?

The limit of reporting (LOR) is the lowest concentration level that the laboratory is able to measure in a sample with a reasonable degree of certainty. Where monitoring shows <LOR, it means that if PFAS is present in the sample it is too low for the laboratory to measure with any degree of certainty.

Seepage Water Results

Seepage water is water that is present in the ground and is moving between surface water and groundwater. The seepage water results recorded during the reporting period remained within the same order of magnitude as historical data. In addition, the majority of the seepage water locations consistently reported PFAS concentrations below the laboratory limit of reporting (LOR) during the reporting period.

One seepage water monitoring location (OTH113 located to the west of the site) recorded a new maximum concentration of the sum of PFOS and PFHxS. Given the isolated occurrence, further monitoring data is required to understand what this first time detect means for that location.

Surface Water Results

Most of the surface water monitoring locations consistently did not detect PFAS concentrations above the laboratory LOR and there were no first-time detections of PFOA or Sum of PFOS and PFHxS, or new exceedance of guidelines. The surface water results recorded during the reporting period remained within the same order of magnitude as historical data.

PFAS concentrations graphed over time were interpreted for all surface water monitoring locations. One surface water location (SW113, Powerhouse area) showed a decreasing trend for PFOS, PFOA and sum of PFOS and PFHxS.

Sediment Results

Overall, the results recorded during the reporting period remained within the same order of magnitude as historical data, and the majority of the sediment sampling locations did not detect PFAS concentrations above the laboratory LOR.

One sediment monitoring location (SD112, located south of the antenna field) recorded a first detect of sum of PFOS and PFHxS during the first flush monitoring event (March 2021). No detect above the LOR was recorded at the same location during the June 2021 biannual event. The March 2021 detect can be related to the heavy rainfall (above average condition in March 2021) which could have resulted in PFAS mobilisation with surface water runoff. Additional monitoring rounds will identify if this is an isolated result.

Risk Summary

The evaluation of analytical results does not suggest the nature and extent of PFAS in groundwater, seepage water, remains consistent with that inferred from previous investigations despite slight fluctuations in PFAS concentrations at individual locations.

The potential exposure pathways for human health (such as recreational anglers in the Management Area) and ecological receptors identified (such as land and aquatic flora and fauna) during the DSI (GHD, 2018) have been reviewed and are still considered to be appropriate.

Information gathered during the monitoring events supported the conclusion made in earlier investigations, that PFAS poses a low risk to recreational anglers with respect to bioaccumulation in commonly caught fish species, and that PFAS poses a low risk to the commercial prawn fisheries of the Exmouth Gulf Managed Prawn Fishery.

The OMP contains management response triggers, which are concentrations that would trigger an additional assessment and risk analysis to determine if additional management is required. None of the management response triggers presented in the OMP were exceeded during the reporting period.

Based on the current available data there is no significant change to this risk profile. Potential changes in groundwater, surface water, seepage water and sediment PFAS concentrations will continue to be evaluated through future monitoring and reporting.

No new source of PFAS contamination, transport pathway or potential receptor have been identified during the reporting period. The risk profile of the management area has not changed and based on the current available data there is no significant change to the risk profile.

Conclusions

The 2020 - 2021 monitoring results met the objective of the OMP and was carried out in general accordance with the SAQP. Results were generally within the range of historical data for all media tested. A few localised first time detects were observed in PFAS concentrations but no change in the current risk understanding is noted for the management area.

The monitoring did not identify a change in the risk profile for the management area that would trigger the need for an OMP review or further management actions.

The ongoing monitoring program of groundwater, surface water, seepage water and sediment should be continued to further understand trends over time and any associated risks.

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Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl substances
PFHxS	Perfluorohexane sulphonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TSS	Total Suspended Solids

Technical Terms & Abbreviations

AFFF	Aqueous Film Forming Foam
AIR	Annual Interpretive Report
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
AST	Above-ground Storage Tank
BGL	Below Ground Level
COC	Chain of Custody
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EC	Electrical Conductivity
EPA	Environment Protection Authority
ERA	Ecological Risk Assessment
HEPA	Heads of Environmental Protection Authority
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
PSI	Preliminary Site Investigation
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
RWL	Reduced water level
SAQP	Sampling and Analysis Quality Plan
SWL	Standing Water Level

Units

ha	Hectares
mBGL	Metres Below Ground Level

mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre
mV	Millivolt
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

OMP	Ongoing Monitoring Plan
PMAP	PFAS Management Area Plan
POL	Petrol oil and lubricants
VLF	Very low frequency

1 Introduction

The Australian Department of Defence ('Defence' or 'Client') engaged Cardno Pty Ltd (Cardno) to undertake the November 2020, first flush (March 2021), and June 2021 groundwater, surface water, seepage water and sediment monitoring events at the Naval Communication Station Harold E Holt – Area A, Western Australia ('HEH-A' or the 'site') and in off-site areas within the Management Area as part of the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP).

1.1 Background

The OMP outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater, seepage water, surface water and sediment originating from the site. The monitoring program consists of biannual monitoring events in November and June, as well a 'first flush' surface water and sediment monitoring event conducted immediately (or as close as possible) following the first heavy rainfall event of the autumn to winter period.

The OMP applies to not only HEH-A, but also the surrounding areas that, together with the site, make up the "Management Area". For the purposes of this report:

- The 'site' is defined as HEH-A.
- The 'Management Area' was defined in the PMAP as comprising the site, plus the land extending to the Exmouth Gulf and Indian Ocean (to the east, north and northwest) (Figure 1, Appendix A).

The site has been the subject of numerous PFAS investigations, including:

- Department of Defence, March 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Management Area Plan'.
- Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Ongoing Monitoring Plan'
- GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area A PFAS Investigations Detailed Site Investigation Report'.
- GHD Pty Ltd, April 2019, reference: 3135526, 'Harold E Holt A Ecological Risk Assessment'.
- Cardno (WA) Pty Ltd, June 2021, 2020 Annual Interpretive Report – Naval Communication Station Harold E Holt Area A – 'PFAS OMP'.

1.2 Purpose & Objectives

The specific objectives of the monitoring specified in the OMP are to:

- Evaluate the nature and extent (spatial and temporal) of PFAS impact in groundwater and surface water pathways associated with site sources of PFAS derived from historical use of Aqueous Film-Forming Foam (AFFF);
- Monitor the migration of PFAS in groundwater, seepage water and surface water from the site;
- Provide confirmation of the current understanding of risk; and
- Provide supporting data for assessment of management actions, where relevant.

The purposes of the Annual Interpretive Report are to:

- Inform Defence and key stakeholders of PFAS trends in surface water, seepage water, groundwater and sediment;
- Assess any variations in the distribution of PFAS for the site and how this changes the understanding of the conceptual site model and risk profile; and
- Provide recommendations for any potential changes in the location and frequency of sampling which may be incorporated in the revision of the OMP.

1.3 Scope of Work

The OMP was carried out in accordance with the scope and limitations presented in Cardno's Sampling and Analysis Quality Plan (SAQP), Appendix B:

> Cardno, June 2021, Reference: DEF19009, 'PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt A'.

The assessment included the following main components:

1. Undertake the November 2020 groundwater, seepage water, surface water and sediment monitoring event:
   - Gauging of 32 single and multi-level groundwater monitoring wells;
   - Sampling of 30 groundwater monitoring wells,
   - Sampling 12 seepage water locations;
   - Sampling of one surface water location; and
   - Sampling of six sediment locations.
2. Undertake the first flush (March 2021) surface water and sediment monitoring event:
   - Sampling of five surface water locations; and
   - Sampling of six sediment locations.
3. Undertake the June 2021 groundwater, seepage water, surface water and sediment monitoring event:
   - Gauging of 32 single and multi-level groundwater monitoring wells;
   - Sampling of 31 groundwater monitoring wells,
   - Sampling of 12 seepage water locations;
   - Sampling of five surface water locations; and
   - Sampling six sediment locations.
4. Data assessment and reporting for the November 2020 – June 2021 reporting period.

1.4 Standards of Assessment and Limitations

This interpretive report has been prepared in general accordance with the current industry standards for an assessment of this type for the purpose, objectives and scope identified in this report.

This report is not any of the following:

> A Mandatory Audit Report (MAR) or Voluntary Audit Report (VAR) as defined under the *Contaminated Sites Act 2003* (CS Act).

> A Geotechnical Assessment.

> A DSI.

> A Detailed Hydrogeological Assessment.

> A Remediation Action Plan (RAP) or Site Remediation & Validation (SRV) report.

> A Site Management Plan (SMP).

2 Site Setting

HEH-A is located approximately 14 kilometres north of Exmouth township, 1,250 km north of Perth, and covers an area of approximately 2,310 hectares (ha). HEH-A was established in 1967 and is host to a very low frequency (VLF) antenna field and associated infrastructure including a central transmitter building, power station, fuel farms, fuel pipelines, Murat Pier and saltwater bore field.

The site is situated at the end of the North West Cape of WA, at the northern edge of the Exmouth Peninsular. HEH-A encompasses the waters extending 400 m around the Point Murat Pier. The majority of the buildings and associated infrastructure and support services are located in the eastern portion of the site and include:

- VLF transmitter Station;
- Bulk fuel storage, referred to as the Petrol Oil Lubricants (POL) Storage Area;
- Bulk fuel storage at the ready use fuel farm (RUFF) above ground storage tanks (ASTs) at the power station;
- Point Murat Pier – diesel fuel supplied by ships berthed at Point Murat Pier and transferred via pipeline (above and below ground) to the POL and ready storage facility adjacent to the power station; and
- Power station.

2.1 Site Definition and Planning

The site location is presented on Figure 1, Appendix A. Key site identification details are presented in Table 2-1.

Table 2-1 Site Identification Details

Details	Description
Site Address	Murat Rd, North West Cape, WA 6707
Land Description	Harold E Holt Area A
Owner	Commonwealth of Australia
Title Details	Lot 44 on Plan P209471
Planning Zone / Land use	Public Purposes – Government Services / Naval Communication Station
Local Government Authority (LGA)	Shire of Exmouth
Boundary corner coordinates (as determined by Cardno) (eastings and northings in GDA94, Zone 50)	▪ North corner: 201,817 mE, 7,588,922 mN ▪ East corner: 209,638 mE, 7,585,003 mN ▪ South corner: 206,410 mE, 7,581,168 mN ▪ West corner: 203,378 mE, 7,585,914 mN

Source: GHD Pty Ltd (December 2018) Naval Communication Station Harold E Holt – Area A Detailed Site Investigation Report (GHD 2018)

2.2 Surrounding Land Uses and Zoning

The surrounding land uses are outlined in Table 2-2.

Table 2-2 Surrounding Land Uses

Direction	Land Use
North	Ningaloo Marine Park / Indian Ocean
West	Ningaloo Marine Park / Indian Ocean
East	Ningaloo Marine Park / Exmouth Gulf, used for commercial aquaculture (prawn fishing)
South	▪ Bundegi Coastal Park and vacant crown land (open space) ▪ HEH-Area B ▪ Exmouth Township

2.3 Monitoring Area Description

The OMP includes sampling and analysis not only from the site, but also from a number of surrounding (off-site) waterways, groundwater bores and seepage locations. The site and these surrounding areas are collectively referred to as the 'Monitoring Area'. The Monitoring Area boundary is presented in Figure 2, Appendix A.

The Monitoring Area is depicted as the 'Management Area' in the HEH-A PFAS Management Area Plan (PMAP) (Defence, 2019) and includes the source areas and the land surrounding the site to the coastline.

2.4 Environmental Setting

Key details defining the site are summarised in Table 2-3.

Table 2-3 Key Site Details

Setting	Description
Climate	The region has a hot, semi-arid climate, with a wet and dry season. The maximum temperatures range between 38.0ºC (January) and 24.6ºC (July) while minimum temperatures range between 11.5ºC (July) and 23.9ºC (February). Rainfall occurs generally between January and July with monsoonal showers between January and Late April. August to December is generally dry. The highest volume of rainfall typically occurs during the month of June with a mean monthly rainfall amount of 43.5 mm.
Topography	Elevation across HEH-A typically range between 1 and 20 meters relative to the Australian Height Datum (m AHD). To the East of HEH-A, the coastline is comprised of sand dunes which have a maximum elevation of 20 mAHD. The dunes have a succession profile of primary and secondary dunes, which increase in elevation with distance from the coast.
Geology	**Regional Geology** The site is underlain by the geological units of the Northwest Cape range primarily comprising carbonate sediments. The Cape Range Group consists of: ▪ Trealla Limestone: permeable, hard and tightly jointed limestone beneath unconsolidated Quaternary deposits. Contains both karst areas and areas of recrystallization. ▪ Tulki Limestone: relatively permeable, hard and tightly jointed. Encountered at depths of 50 to 100 m below ground level (mBGL). Karst features such as caves occur within the recrystallised limestone. ▪ Mandu Limestone: low permeability limestone encountered at greater than 150 mBGL. ▪ The Birdrong Sandstone which underlies the Cape Range Group, comprising a fine to coarse grained silty sandstone. **Site Specific Geology** Previous environmental investigations have reported that the geology at HEH-A is primarily a clay pan, comprising silt, sand and gravels. The clay pan encompasses the majority of the far north eastern tip of the peninsula and is fringed along the coast to the north and east of the site by extensive beach and coastal dunes.
Acid Sulfate Soil	A review of the Acid Sulfate Soils (ASS) risk mapping, available on the WA Atlas online database indicates that most of the area encompassing the site is classified as having either a high to moderate or moderate to low risk of ASS occurring.
Hydrology	HEH-A can be inundated by sea water during extreme storm surges. Later evaporation of this water has left visible salt crusts and localised hypersaline conditions. The coastal sand dunes and inland topographical depression that characterise HEH-A, effectively form a basin where, in the absence of drainage pathways to the coast, surface water can stand for up to several months following substantial rainfall events and storm surges. Site drainage primarily follows the local topography, prior to infiltration into the ground surface.

Setting	Description
Hydrogeology	The Quaternary and Tertiary-aged sediments are hydraulically interconnected and together form the major, unconfined aquifer of the area. The superficial Quaternary layers (dunes, colluvium, alluvium) are considered to be no more than 20 m in thickness. ▪ **Groundwater Occurrence/Quality** – The main regional aquifer occurs predominantly within the Tulki Limestone (within permeable beds and the karst system) on the flanks of the Cape Range and the Mandu Limestone (within joints and minor permeable beds) on the crest of the Cape Range. The aquifer is unconfined and is recharged by rainfall. Groundwater in the Quaternary units is considered to be perched and discontinuous. The coastal dunes may also contain relatively fresh groundwater, however of limited extent (lenses), but may influence groundwater flow directions locally. The groundwater underlying the clay/salt pan is hypersaline due to the clay pan acting as an evaporation basin where salts are concentrated. Brackish groundwater conditions exist around the power station and POL areas, which may indicate an interaction with fresher recharge source. ▪ **Depth to Groundwater** – Groundwater has been recorded beneath the site at shallow levels between -0.03 and 0.57 m AHD during the June 2021 event (approximately 2 to 4 mBGL). The hydraulic gradient of the site is low (in the order of 0.0002 to 0.003 m/m). The groundwater is therefore likely to be vulnerable to local changes in flow direction through preferential recharge. ▪ **Groundwater Flow Direction** – The November 2020 and June 2021 inferred groundwater elevation contours indicated a generally consistent groundwater flow direction from the sand dunes towards the central clay pan area (i.e. inland direction). The DSI (GHD, 2018) determined that a tidal influence was visible at most wells with a consistent flow over tidal periods. Figure 4, Appendix A shows the groundwater levels and flow direction recorded during the latest June 2021 monitoring event. ▪ **Groundwater Use** – No registered groundwater bores were identified within a 1.0 km radius of HEH-A. A number of unregistered extraction bores are understood to be present at residential properties within the township of Exmouth, located approximately 14 km south of the site. Saltwater production bores are installed within the Trealla Limestone to the southeast of the power plant compound area. Groundwater is continuously pumped from this borefield, which may be responsible for localised deviations in the groundwater elevation contours near the south-east portion of the site. ▪ **Protective Drinking Water Source Area (PDSA**) – The site is not located within a PDSA, The Exmouth Water Reserve drinking water source protection review Area, a Priority 1 area, is located approximately 12 km southwest of the site at its closest point. Priority 1 areas are usually undeveloped and under state management. ▪ **Receiving Surface Water Body** – A component of flow from the sand dunes towards the coast is present on the eastern coast near Murat Pier, although this is reversed at high tide, such that groundwater discharges over full tidal cycles may be minimal. Previous investigations reported a very low hydraulic gradient for the site.
Environmental Sensitive Areas	The site occurs within an area that is included on the Register of the National Estate because of its natural heritage value, under the Australian Heritage Council Act 2003 of the Commonwealth. ▪ The Cape Range Subterranean Waterways wetlands occurs across the site. ▪ The Cape Range National Park is located approximately 16 km to the southwest of the site at its closest point. ▪ The Jurabi Coastal Park is adjacent to the west of the site. ▪ The Bundegi Conservation Reserve is adjacent to the southeast of the site. The Ningaloo Coast, a World Heritage listed site is located within 10 km of HEH-A. The Ningaloo Coast is also listed on the National Heritage Property register.
Wetlands	The site occurs within the Cape Range subterranean Waterways wetland, listed under the Directory of Important Wetlands.
Further information can be found in the DSI report (GHD, 2018).	

2.5 Source Areas

Three main source areas for PFAS contamination were identified during the DSI (GHD, 2018) and associated with risks to receptors as identified in the PMAP (Defence, 2019):

- The POL Storage Area;
- The Powerhouse; and
- Murat Pier.

PFAS were detected in all media tested (sediment/surface soils, groundwater and surface water) with the highest concentrations observed for the soil in the source areas. The extent of contamination identified during the early stages of investigations (i.e. DSI and ERA) indicates that "*PFAS concentrations in groundwater were generally low across the site, with higher concentrations in the immediate vicinity of the bulk fuel storages at the POL Storage Area and the Power Station*" (Defence, 2019).

3 Sampling and Analytical Methodology

3.1 2020 – 2021 Sampling Dates

A summary of the monitoring dates for each event of the reporting period is presented in Table 3-1.

Table 3-1 Summary of sampling dates

Sampling event	OMP activity	Sampling period
November 2020	Groundwater monitoring (sampling and gauging)	17-18 November 2020
	Surface water, seepage water and sediment sampling	
First flush 2021	Surface water and sediment sampling	03 and 05 March 2021
June 2021	Groundwater monitoring (sampling and gauging)	22 – 23 June 2021
	Surface water, seepage water and sediment sampling	

3.2 Groundwater Sampling

Sampling of selected groundwater monitoring locations was performed in accordance with the SAQP (Cardno 2021, Appendix B), applying methods set out in Section 6.3.3 of the SAQP.

The groundwater wells monitored as part of the OMP are presented in Table 3-2 and are shown on Figure 3, Appendix A.

Table 3-2 Groundwater Monitoring Locations

Monitoring Area	Location ID
Powerhouse	MW017, MW027, MW213, MW214, MW104, MW101, MW102, MW103, MW019, MW123
Fuel Farm	MW119, MW105, MW003, MW008, MW212, MW210
Powerhouse Pathway	MW218, MW117, MW217, MW116, MW115, MW114, MW113
Fuel Farm Pathway	MW109, MW112, MW110, MW202, MW107, MW111
Broader Area	MW134, MW130, MW129

3.3 Seepage Water Sampling

Seepage water monitoring and sampling was conducted in accordance with the SAQP (Cardno 2021, Appendix B), applying methods set out in Section 6.2.3 of the SAQP. The seepage water monitoring locations monitored as part of the OMP are listed in Table 3-3 and are shown on Figure 3, Appendix A.

Table 3-3 Seepage water Monitoring Locations

Monitoring Area	Location ID
Powerhouse Pathway	OTH108, OTH107, OTH106, OTH105
Fuel Farm Pathway	OTH101, OTH104, OTH103,
Broader Area	OTH113, OTH110, OTH109, OTH102
Murat Pier salt water discharge water	OTH002

3.4 Surface Water Sampling

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP (Cardno 2021, Appendix B) applying methods set out in Section 6.3.3 of the SAQP. The surface water locations monitored as part of the OMP are presented in Table 3-4 and are shown on Figure 3, Appendix A.

Table 3-4 Surface water Monitoring Locations

Monitoring Area	Location ID
Broader area	SW126, SW128, SW120, SW112, SW127
Powerhouse	SW113

3.5 Sediment Sampling

Sampling of selected sediment monitoring locations was performed in accordance with the SAQP (Cardno 2021, Appendix B), applying methods set out in Section 6.4.3 of the SAQP. The sediment locations monitored as part of the OMP are presented in Table 3-5 and are shown on Figure 3, Appendix A.

Table 3-5 Sediment Monitoring Locations

Monitoring Area	Location ID
Broader area	SD126, SD128, SD120, SD112, SD127
Powerhouse	SD113

3.6 Deviations from the OMP SAQP

Deviations from the SAQP for the November-20 – June-21 reporting period are summarised in Table 3-6.

Table 3-6 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
	November 2020	
MW213	Not sampled	This groundwater monitoring bore was found dry
MW116		This groundwater monitoring bore was found locked with a padlock
SW113, SW120, SW126, SW127, SW128		These sampling locations were found dry
	First Flush 2021	
SW126	Not sampled	This location was found dry.
	June 2021	
MW123	Not sampled	Access denied due to Base activities.
SW126	Not sampled	This surface water monitoring location was found dry
MW101, MW213	Dissolved organic carbon (DOC) not analysed	Insufficient amount of water to filter and fill DOC vial
MW129	DOC not analysed	Total organic carbon (TOC) analysed instead. Sample not field filtered due to high turbidity.
MW214	Non-PFAS analytes not analysed	Insufficient amount of water to collect all sampling bottles.

These minor deviations from the SAQP, mostly related to dry locations not sampled, are not considered to have impacted the data set obtained during the reporting period or the interpretative assessment presented in this report.

3.7 Changes to the Monitoring Network Condition

No changes to the monitoring network condition were noted during the reporting period.

4 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

- Quality Assurance (QA) documentation.
- Bias.
- Data Representativeness.
- Data Precision & Accuracy.
- Laboratory Performance.
- Data Comparability.
- Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in the factual reports in Appendix C.

4.1 Summary

The laboratory has undertaken different Quality Control (QC) measures in all sets of sample analysis which validate the accuracy of their techniques. The laboratory is appropriately certified for environmental sample analysis. It is considered that the results are accurate and reliable for the purposes of this assessment.

The data validation process has concluded that there are no significant systematic errors in the data collection process. Therefore, the data set used as the basis for the surface water, groundwater and sediment assessment is considered valid and complete.

5 Assessment Criteria

5.1 Groundwater, seepage water and surface water

The adopted assessment criteria for groundwater, seepage water and surface water are detailed in Table 5-1.

Table 5-1 Criteria for Groundwater, Seepage and Surface water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS	PFOA	
	µg/L		
Human Health – Recreational Water	2[1]	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023[2]	19	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020).

5.2 Sediment

It is noted that there are currently no Australian regulatory endorsed assessment levels for risk posed to ecology or human health by PFAS in sediment. As detailed in the SAQP (Cardno, 2021), sediment samples will be assessed with reference to the PFAS NEMP 2.0 (HEPA, 2020) soil criteria for consistency with the DSI (GHD, 2018). The adopted assessment criteria for sediment are detailed in Table 5-2.

Table 5-2 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS	PFOA	
	mg/kg		
Human Health - Commercial / industrial (on-base activities)	20[1]	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1[2]	10	HEPA 2020
Ecological - indirect exposure (interim guidelines)	0.01[2]	-	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only

6 Contextual and Ancillary Information

6.1 Additional Analytical Data

All data available on the ESdat database at the time of reporting for each OMP monitoring location (including Aurecon data from WA_0083_FSBGME) was utilised to form the basis of the interpretations and conclusions presented in this report.

6.2 Remediation and Infrastructure Projects

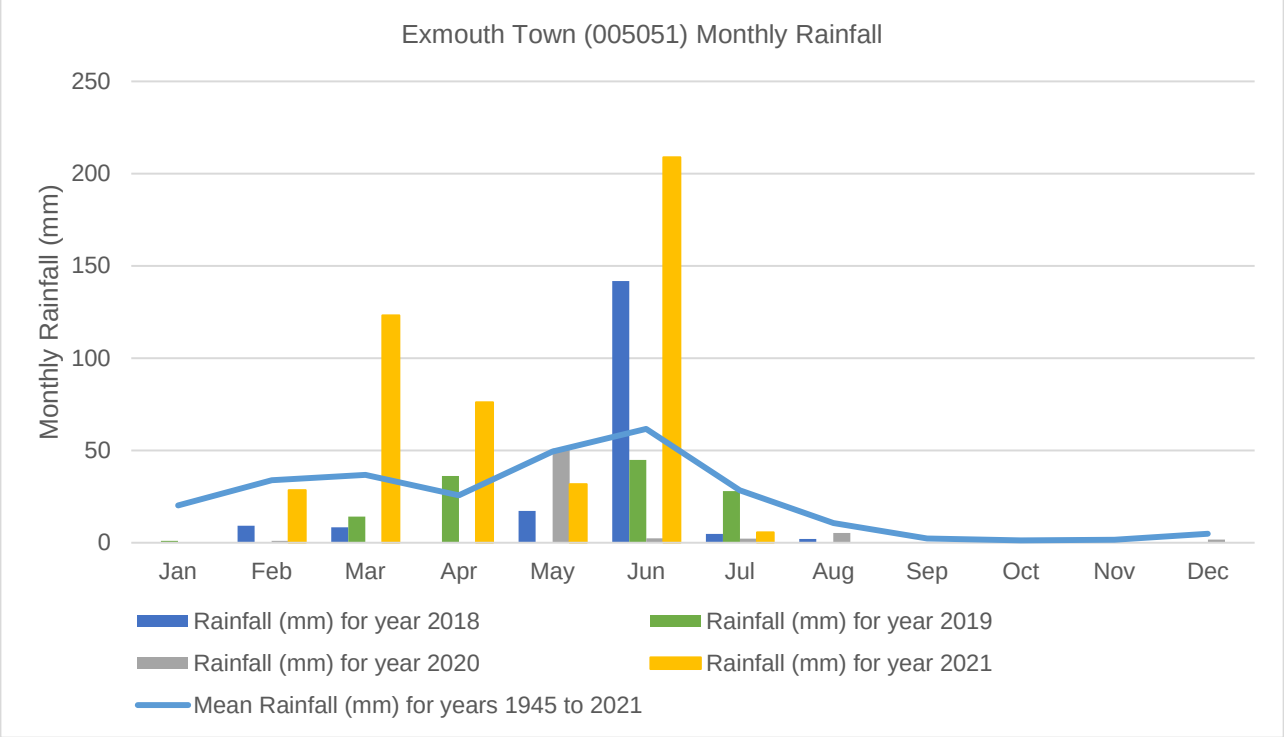
No remediation project or infrastructure works that could affect the interpretation of monitoring results were undertaken at the site during the reporting period.

6.3 Climate

Rainfall can potentially influence the PFAS migration and groundwater levels. Monthly rainfall for 2018 to 2021 obtained from the BoM station No 005051 is displayed in Figure 6-1.

Rainfall for 2020 was generally below average with the exception of the month of December. Rainfall for 2021 was above average for the months of March, April and June.

Figure 6-1 Monthly rainfall and long term mean monthly rainfall for Exmouth Town (station 005051) (BoM, 2021)



There were variations in rainfall over June and December for 2020 and March for 2021, however, it is noted that these climatic conditions have not affected the groundwater gradient or flow direction for the monitoring area.

No rainfall occurred during the biannual monitoring events. 32.0 mm were recorded on the 3rd March 2021 during the first flush monitoring event. 85.8 mm recorded on the 2nd March 2021 recorded at the Exmouth Town weather station (Station No. 005051) triggered the start of the first flush sampling event. These conditions are considered to be characteristic of a first flush event.

A large weather event occurred on 10th June 2021 where 173.4 mm of rain was recorded at the Exmouth Town weather station (Station No. 5051) which exceeded the 90th percentile for rainfall ever recorded at this location. This caused significant flooding to the low laying areas of the salt pans and the Town Centre to the South however is not considered an extreme event as it does not fall in the 99th percentile as defined by the Bureau of Meteorology. It however allowed most of the surface water monitoring locations to be sampled during the subsequent June 2021 biannual monitoring event.

7 Monitoring Data Summary

The November 2020, first flush 2021 (March 2021) and June 2021 monitoring results are presented within the factual reports provided in Appendix C. Laboratory results are summarised in Tables 1, 2 and 3 in Appendix D. This section presents a summary of the monitoring data for the reporting period.

7.1 Groundwater

7.1.1 Groundwater geochemical parameters

Groundwater geochemical parameters (dissolved oxygen [DO], electrical conductivity [EC], total dissolved solids [TDS] and oxidation-reduction potential [ORP]) recorded in the field during the November 2020 and June 2021 monitoring events are summarised in Table 7-1 and provided in Table 4, Appendix D.

Table 7-1 Groundwater Geochemical Parameters

Parameter	November 2020	June 2021
DO	0.79 mg/L (MW105) – 4.1 mg/L (MW117) *Aerobic conditions*	0.55 mg/L (MW111) – 5.38 mg/L (MW114) *Aerobic conditions*
EC	584 µS/cm (MW113) – 98,983 µS/cm (MW119)	5,367 µS/cm (MW213) – 53,824 µS/cm (MW112)
TDS	5,850 mg/L (MW112) – 49,855 mg/L (MW123) *Saline water to Brine Conditions*	3,491 mg/L (MW213)– 34,990 mg/L (MW112) *Saline water to Brine Conditions*
pH	4.57 (MW112– 8.34 (MW119) *Strongly Acidic to Moderately Alkaline*	6.62 (MW027) – 8.25 (MW214) Slightly Acidic to Moderately Alkaline
ORP	-226.6 (MW111) – 244.2 (MW114) *Reducing to oxidising groundwater conditions.*	-313.6 mV (MW111) – 146.9 mV (MW116) *Reducing to oxidising groundwater conditions.*

The geochemical parameters were generally within the historical ranges recorded for the site. Slight seasonal variability is observed in the salinity parameters (EC and TDS) and DO, this can be attributed to the groundwater recharge from rainfall events.

7.1.2 Groundwater elevations and migration contours

Groundwater levels and flow directions recorded during the November 2020 and June 2021 monitoring events are summarised in Table 7-2 and gauging data is provided within Table 6, Appendix D. Figure 4, Appendix A, presents the inferred groundwater contours for the most recent monitoring event (June 2021).

Table 7-2 Groundwater Levels and Flow Direction

Item	November 2020	June 2021
Depths to groundwater (mbTOC)	0.77 (MW123) – 9.981 (MW134)	1.701 (MW130) – 9.75 (MW134)
Groundwater elevation (mAHD)	-0.2344 (MW123) – 0.729 (MW202)	0.029 (MW116) – 2.314 (MW107)
Inferred direction of groundwater flow	Groundwater was interpreted to be radial from the site with mounding occurring in the sand dunes where rainfall infiltrates.	
Seasonal difference in groundwater elevation	Groundwater levels were on average 0.26 m shallower during the June 2021 event	

Groundwater elevations and radial flow direction for the reporting period were consistent with historical data. It is noted that the well gauging data was collected over several days and tide cycles. This has been considered when interpreting the inferred groundwater contours and direction. Seasonal difference observed in groundwater depth can be linked to groundwater recharge with rainfall infiltration during the winter months.

7.1.3 Groundwater Results Summary

7.1.3.1 On-site Source Areas Summary Results

As indicated the on-site Source Areas consist of:

- The POL Storage Area; and
- The Powerhouse.

7.1.3.2 POL Storage Area

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the POL Storage Area monitoring locations are presented in Table 7-3 and plotted on Figure 7-1.

The highest concentration recorded was in MW003 during the November 2020 event (Sum of PFOS and PFHxS = 16.1 µg/L) which is within historical range for this monitoring well, however, it is also noted that a new minimum one order of magnitude below historical results was recorded at this well in June 2021. New concentration minimums were recorded for three out of the six monitoring locations for sum of PFOS and PFHxS and two locations for PFOA.

A new Sum of PFOS and PFHxS maximum was recorded at MW212 however the concentration was only slightly above historical range.

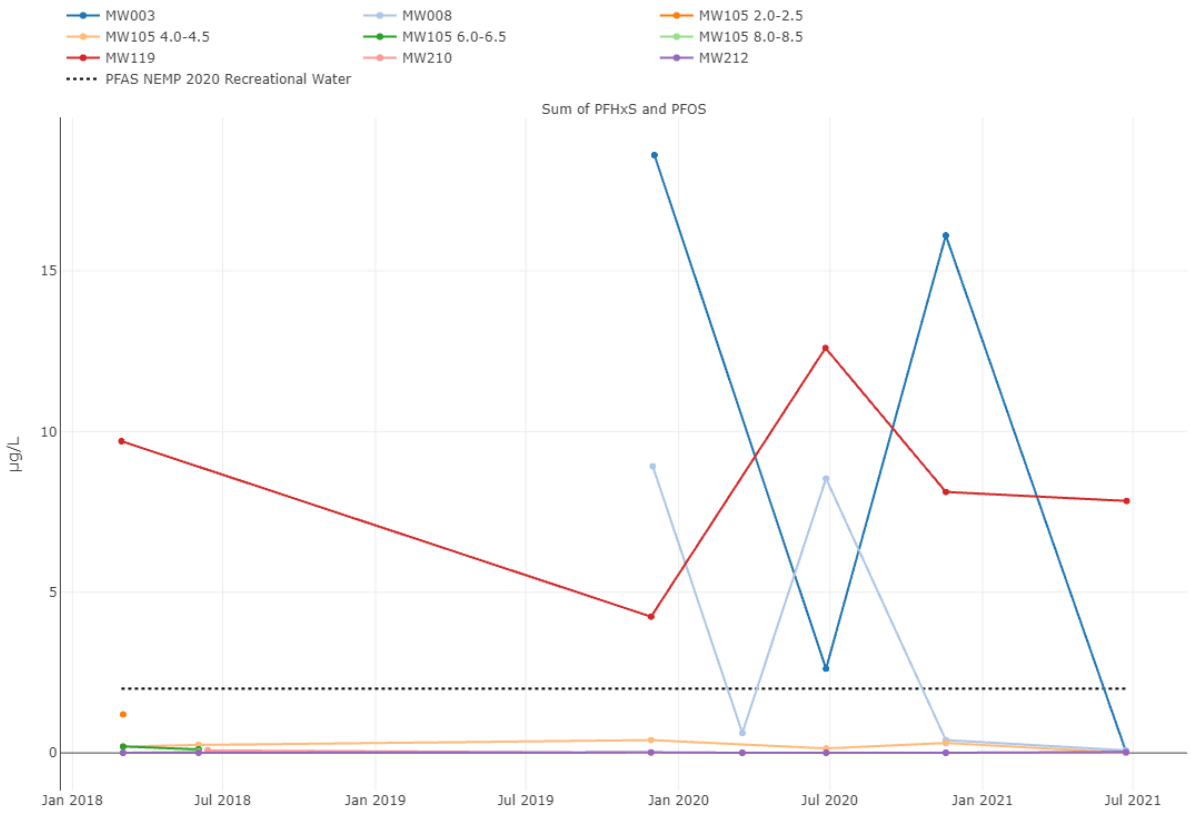
Table 7-3 POL Storage Area Sum of PFOS and PFHxS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW003	PFOS and PFHxS	2.62 – 18.6	16.1	0.04
	PFOA	0.029 – 1.34	0.18	0.01
MW008	PFOS and PFHxS	0.62 - 15	0.4	0.08
	PFOA	0.01 – 0.51	<0.01	<0.01
MW105	PFOS and PFHxS	0.14 – 1.2	0.31	<0.01
	PFOA	<0.01 – 0.29	0.03	<0.01
MW119	PFOS and PFHxS	4.24 – 12.6	8.12	7.84
	PFOA	0.04 – 0.22	0.14	0.16
MW210	PFOS and PFHxS	<0.01 – 0.079	<0.01	<0.01
	PFOA	<0.001 – 0.004	<0.01	<0.01
MW212	PFOS and PFHxS	<0.001 – 0.02	<0.01	0.03
	PFOA	<0.001 – <0.01	<0.01	<0.01

New Maximum | New Minimum | New Exceedance

Note:
MW105 multilevel well
For multi-level wells, the shallowest non-dry screen interval is sampled during each monitoring event

Figure 7-1 POL Storage Area Sum of PFOS and PFHxS Concentrations Trends



Note: Values below LOR were replaced by the lowest LOR value (0.001 µg/L) for the purpose of graphical representation.

7.1.3.3 Powerhouse

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Powerhouse monitoring locations are presented in Table 7-4 and plotted on Figure 7-2.

Only one well has recorded concentrations above the adopted HEPA (2020) recreational use criteria for the sum of PFOS and PFHxS (MW017). However, it is noted that a new minimum for this location was recorded during the June 2021 event.

A new minimum for sum of PFOS and PFHxS was recorded at 5 of the 10 locations (MW017, MW019, MW101, MW103 & MW104) sampled for the Powerhouse area for the November 2020 and June 2021 monitoring events.

Three locations (MW027, MW101 & MW103) recorded new minimums for PFOA over the November 2020 and June 2021 monitoring events.

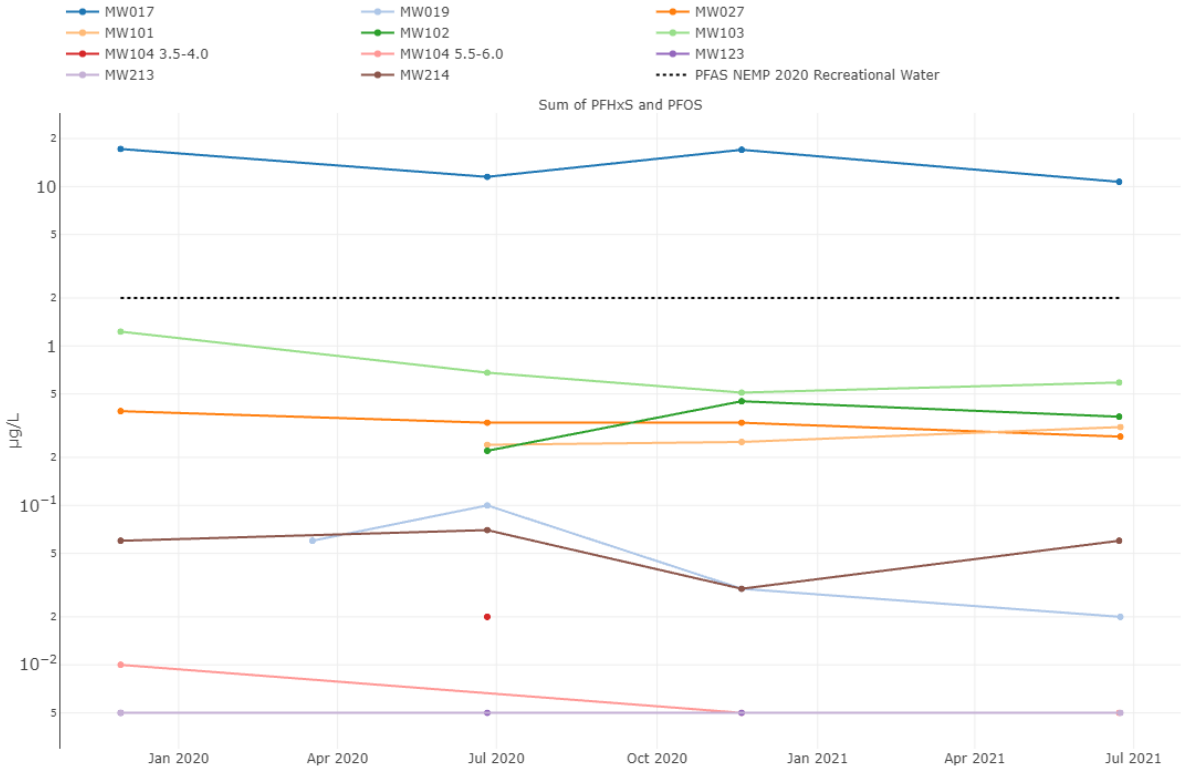
Table 7-4 Powerhouse Area Sum of PFOS and PFHxS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW017	PFOS and PFHxS	11.5 – 17.8	17.0	10.7
	PFOA	0.78 – 2.1	0.8	0.54
MW019	PFOS and PFHxS	0.06 – 0.116	0.03	0.02
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW027	PFOS and PFHxS	0.288 – 0.53	0.33	0.27
	PFOA	0.01 – 0.031	0.01	<0.01
MW101	PFOS and PFHxS	0.24 – 0.537	0.25	0.31
	PFOA	0.03 – 0.11	0.02	0.05
MW102	PFOS and PFHxS	0.22 – 0.744	0.45	0.36
	PFOA	<0.01 – 0.13	0.06	0.10
MW103	PFOS and PFHxS	0.68 – 1.31	0.51	0.59
	PFOA	0.03 – 0.084	0.02	0.04
MW104	PFOS and PFHxS	0.004 – 0.02	<0.01	<0.01
	PFOA	<0.001 – 0.003	<0.01	<0.01
MW123	PFOS and PFHxS	<0.001 – 0.001	<0.01	NS
	PFOA	<0.001 - <0.01	<0.01	
MW214	PFOS and PFHxS	0.028 – 0.07	0.03	0.06
	PFOA	<0.01 – 0.006	<0.01	<0.01
MW213	PFOS and PFHxS	<0.01 – 0.091	NS	<0.01
	PFOA	<0.001 – 0.004		<0.01

New Maximum | New Minimum | New Exceedance

Notes:
NS – Not sampled
MW104 multilevel well
For multi-level wells, the shallowest non-dry screen interval is sampled during each monitoring event

Figure 7-2 Powerhouse Area Sum of PFOS and PFHxS Concentrations Trends



Note: A logarithmic scale was used for the vertical axis. Values below LOR were replaced by the lowest LOR value (0.001 µg/L) for the purpose of graphical representation.

7.1.3.4 POL Pathway Area

The Pathway Areas are monitored to provide a confirmation of overall PFAS impact identified in the DSI (GHD, 2018) and indication of a potential migration of the PFAS plume from the source areas.

Assessment of changes in PFAS concentrations and distribution in the main migration pathways allows for early detection of significant changes in migration enabling contingencies to be put in place.

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the POL Pathway Area monitoring locations are presented in Table 7-5 and plotted on Figure 7-3.

The highest Sum of PFOS and PFHxS concentration recorded was in MW107 during the November 2020 event. The result (0.05 µg/L) was however one order of magnitude below historical maximum for this monitoring well.

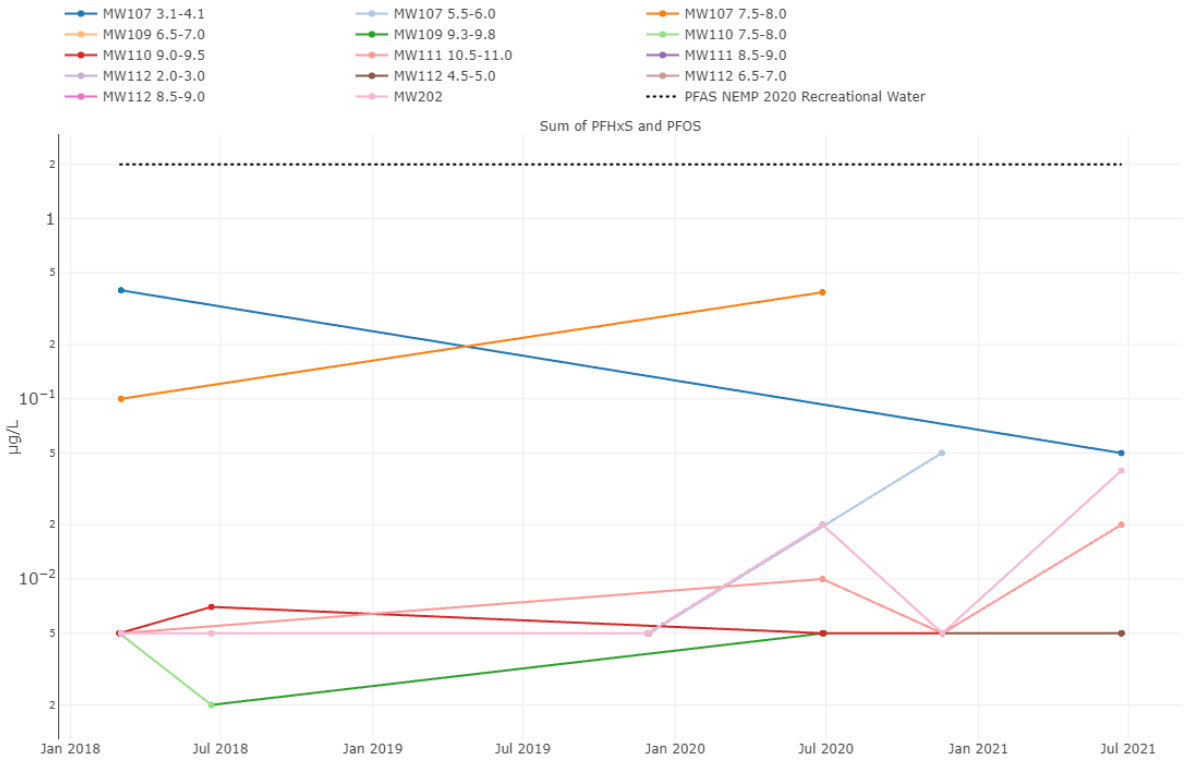
MW111 and MW202 recorded new maximums for sum of PFOS and PFHxS during the June 2021 event however these were only marginally above historical ranges and within the same order of magnitude as the LOR.

Table 7-5 POL Pathway Area Sum of PFOS and PFHxS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW107	PFOS and PFHxS	<0.01 – 0.4	0.05	0.05
	PFOA	<0.001 – 0.008	<0.01	<0.01
MW109	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW110	PFOS and PFHxS	<0.001 – 0.002	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW111	PFOS and PFHxS	<0.001 – 0.01	<0.01	0.02
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW112	PFOS and PFHxS	<0.001 – 0.02	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW202	PFOS and PFHxS	<0.001 -0.02	<0.01	0.04
	PFOA	<0.001 - <0.01	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Notes:
MW000 multilevel well
For multi-level wells, the shallowest non-dry screen interval is sampled during each monitoring event

Figure 7-3 POL Pathway Area PFHxS and PFOS Concentrations Trends



Note: A logarithmic scale was used for the vertical axis. Values below LOR were replaced by the lowest LOR value (0.001 µg/L) for the purpose of graphical representation.

7.1.3.5 Powerhouse Pathway Area

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Powerhouse Pathway Area monitoring locations are presented in Table 7-6. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted.

All wells sampled during the November and June events recorded PFAS concentrations below the laboratory LOR.

Table 7-6 Powerhouse Pathway Area PFHxS and PFOS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW113	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW114	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW115	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW116	PFOS and PFHxS	<0.001 – 0.003	<0.01	<0.01
	PFOA	<0.001 – 0.001	<0.01	<0.01
MW117	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW217	PFOS and PFHxS	<0.001 – 0.003	<0.01	<0.01
	PFOA	<0.001 – 0.001	<0.01	<0.01
MW218	PFOS and PFHxS	<0.001 – 0.004	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Notes
MW000 multilevel well
For multi-level wells, the shallowest non-dry screen interval is sampled during each monitoring event

7.1.3.6 Broader Area Wells

The Broader Area wells are sampled to assess the presence of PFAS concentrations in the wider environment.

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the broader area monitoring locations are presented in Table 7-7. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted.

A new maximum was recorded for MW129 for Sum of PFOS and PFHxS during the June 2021 event.

Table 7-7 Broader Area PFHxS and PFOS, and PFOA Concentrations

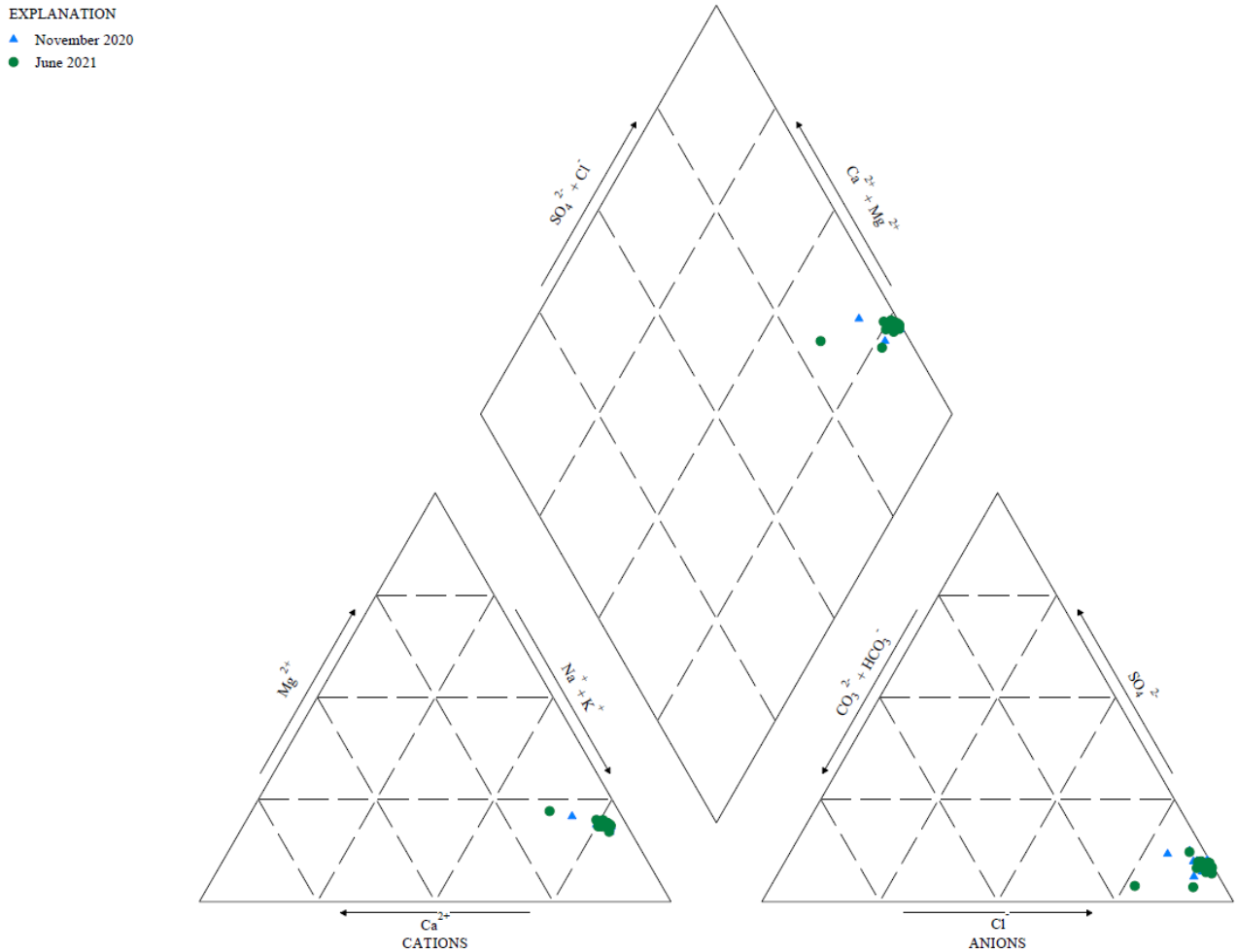
Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW129	PFOS and PFHxS	0.012 - 0.11	<0.01	0.75
	PFOA	<0.01 - 0.007	<0.01	<0.01
MW130	PFOS and PFHxS	<0.001 - 0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW134	PFOS and PFHxS	<0.01 - 0.008	<0.01	<0.01
	PFOA	<0.01 - 0.003	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Note:
For multi-level wells, the shallowest non-dry screen interval is sampled during each monitoring event

7.1.4 Major Ions Analysis

Major ions analysis was conducted on the groundwater samples collected during each monitoring event to categorise the water type. The results of the major ion analysis are visually represented in a Piper Diagram shown in Figure 7-4. Groundwater hydrochemistry is consistent between each sampling event and across the monitoring network. Groundwater samples all plot in the Sodium Chloride groundwater type in the diagram. MW213 and MW214 located at the Powerhouse display a slight variation which can be related to the difference of salinity observed at these wells. A small fresher water lens could be present under this area.

Figure 7-4 Piper Diagram – Groundwater samples



7.2 Seepage Water

7.2.1 Seepage water geochemical parameters

Seepage water geochemical parameters recorded during the November 2020 and June 2021 monitoring events are summarised in Table 7-8 and provided Table 4, Appendix D.

Table 7-8 Seepage water Geochemical Parameters

Parameter	November 2020	June 2021
DO	1.10 mg/L – 5.34 mg/L *Aerobic conditions.*	3.99 mg/L – 6.13 mg/L *Aerobic conditions.*
EC	29,130 µS/cm – 63,065 µS/cm	28,920 µS/cm – 55,423 µS/cm
TDS	35230 mg/L – 38545 mg/L *Highly saline to Brine conditions.*	18,798 mg/L – 36,010 mg/L *Highly saline to Brine conditions.*
pH	7.86 – 8.22 *Neutral to slightly alkaline conditions.*	7.87 – 8.10 *Neutral to slightly alkaline conditions.*
ORP	-15.9 mV – 190.3 mV *Reducing to oxidising conditions.*	-163.5 mV – 136.3 mV *Reducing to oxidising conditions.*

7.2.2 Seepage water results summary

As part of the OMP, seepage water is sampled to assess the changes in PFAS concentrations at the receptor (Indian Ocean), downgradient of the identified source areas, including water discharged to Exmouth Gulf, which comes from the salt water bore field and the Powerhouse water treatment system.

Seepage water has been sampled since February 2018 during an outgoing tide. Detects of PFOA, PFOS and the sum of PFOS and PFHxS have been recorded during this period. 11 out of 12 samples analysed reported PFAS concentrations below the laboratory LOR during the November 2020 and June 2021 events.

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the seepage water monitoring locations are presented in Table 7-9. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted. A new maximum was recorded at 1 location (OTH113) for Sum of PFOS and PFHxS during the June 2021 event.

Table 7-9 Seepage Water Sum of PFOS and PFHxS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
OTH002	PFOS and PFHxS	<0.001	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH101	PFOS and PFHxS	<0.001 – 0.004	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
OTH102	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
OTH103	PFOS and PFHxS	<0.001 – 0.006	<0.01	<0.01
	PFOA	<0.001 – 0.003	<0.01	<0.01
OTH104	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
OTH105	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 – 0.001	<0.01	<0.01
OTH106	PFOS and PFHxS	<0.001 – 0.005	<0.01	<0.01

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
	PFOA	<0.001 – 0.001	<0.01	<0.01
OTH107	PFOS and PFHxS	<0.0002 - <0.001	<0.01	<0.01
	PFOA	<0.001 – 0.001	<0.01	<0.01
OTH108	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 – 0.001	<0.01	<0.01
OTH109	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
OTH110	PFOS and PFHxS	<0.01-0.003	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
OTH113	PFOS and PFHxS	<0.01-0.005	<0.01	0.56
	PFOA	<0.001 - <0.01	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

7.3 Surface Water

Surface water is sampled across the broader area and in the vicinity of the Powerhouse to assess the presence of PFAS in the wider environment and to assess PFAS concentrations in surface water overflowing on to the roadway (Powerhouse).

7.3.1 Surface water results summary

Surface water has been sampled since February 2018. In addition, to the November 2020 and June 2021 events a first flush event was also undertaken in March 2021. Surface water is generally observed pooling in the clay pan (low lying areas north, west and south of the antenna field). Geochemical parameters recorded in the field are provided in Table 4, Appendix D.

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the surface water monitoring locations are presented in Table 7-10. It is noted that a number of the sample locations were dry or predominantly below laboratory LOR during the November 2020 and June 2021 events and therefore the results have not been plotted.

Table 7-10 Surface Water Sum of PFOS and PFHxS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (Mar 2021) (µg/L)	Jun 2021 (µg/L)
SW112	PFOS and PFHxS	<0.01 - 0.05	<0.01	<0.01	<0.01
	PFOA	<0.01	<0.01	<0.01	<0.01
SW113	PFOS and PFHxS	0.65 – 2.4	NS	0.35	0.13
	PFOA	0.22 – 0.86		0.12	0.07
SW120	PFOS and PFHxS	<0.01 - 0.002	NS	<0.01	<0.01
	PFOA	<0.01		<0.01	<0.01
SW126	PFOS and PFHxS	0.003	NS	NS	NS
	PFOA	<0.001			
SW127	PFOS and PFHxS	<0.01 - 0.002	NS	<0.01	<0.01
	PFOA	<0.01		<0.01	<0.01
SW128	PFOS and PFHxS	<0.01	NS	<0.01	<0.01
	PFOA	<0.01		<0.01	<0.01

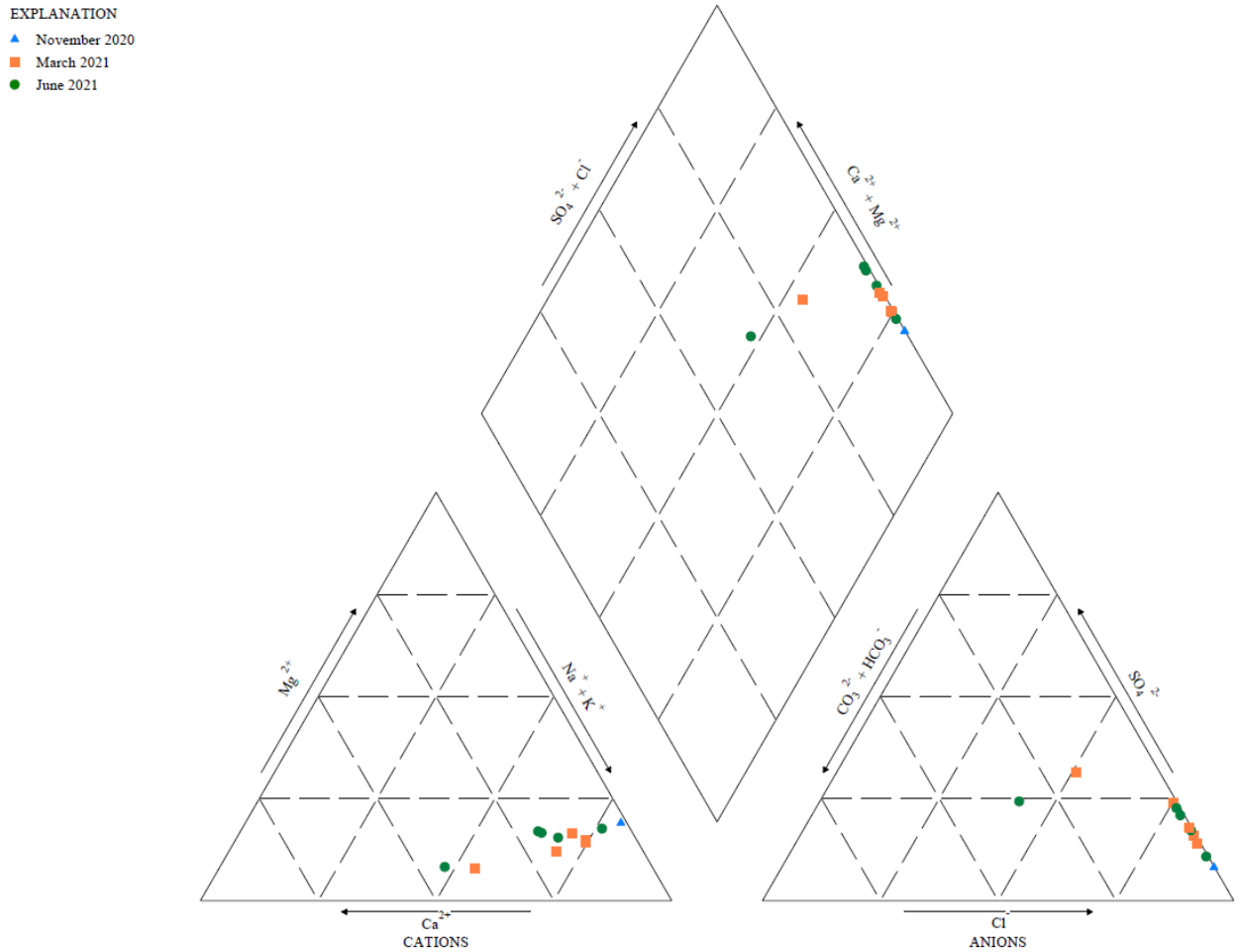
Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (Mar 2021) (µg/L)	Jun 2021 (µg/L)
New Maximum		New Minimum		New Exceedance	

Notes:
NS - Not Sampled / SW126 was only sampled once in June 2018 as the location was found dry on all other occurrences.

7.3.2 Major Ions Analysis

Major ions analysis was conducted on the surface water samples collected during each monitoring event to categorise the water type. The results of the major ion analysis are visually represented in a Piper Diagram shown in Figure 7-5. With the exception of one outlier (SW113, collected from a sump at the Powerhouse), the samples all plot in the sodium chloride water type, which is consistent with the observations on groundwater and support the interpretation of groundwater recharging through surface water infiltration.

Figure 7-5 Piper Diagram - Surface water samples



7.4 Sediment

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the sediment sampling locations are presented in Table 7-11. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted.

Sediment has been sampled periodically since February 2018. In addition to the November 2020 and June 2021 events a first flush event was also undertaken in March 2021. Field records are provided in Table 5, Appendix D. A first time detect of Sum of PFOS and PFHxS, and hence a new concentration maximum, was recorded for SD112 during the 2021 first flush event. No exceedance of the adopted guidelines was reported at any of the sediment monitoring locations.

Table 7-11 Sediment PFHxS and PFOS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (Mar 2021) (mg/kg)	Jun 2021 (mg/kg)
SD112	PFOS and PFHxS	<0.0002	<0.0002	0.0003	<0.0002
	PFOA	<0.0002	<0.0002	<0.0002	<0.0002
SD113	PFOS and PFHxS	0.0025-0.0093	0.0085	0.0011	0.0013
	PFOA	0.0003-0.0007	0.0009	<0.0002	<0.0002
SD120	PFOS and PFHxS	<0.0002	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SD126	PFOS and PFHxS	<0.0002	<0.0002	<0.0002	<0.0002
	PFOA	<0.0002	<0.0002	<0.0002	<0.0002
SD127	PFOS and PFHxS	<0.0002	<0.0002	<0.0002	<0.0002
	PFOA	<0.0002	<0.0002	<0.0002	<0.0002
SD128	PFOS and PFHxS	<0.0002	<0.0002	<0.0002	<0.0002
	PFOA	<0.0002	<0.0002	<0.0002	<0.0002

New Maximum | New Minimum | New Exceedance

8 Interpretive Analysis

This section discusses and interpret the results of the November 2020, first flush 2021 (March 2021) and June 2021 monitoring events considering historical results collected since 2018.

Trends in concentrations over time have been assessed using the publicly available GSI Environmental Mann-Kendall toolkit (GSI, 2012). A minimum of four results per monitoring location are required to calculate a trend (i.e. increasing, stable or decreasing)[3]. The Mann Kendall test relies of three statistical metrics (GSI, 2012), as follow:

- The **'S' Statistic** indicates whether concentration trend versus time is generally decreasing (S<0) or increasing (S>0).
- The **Confidence Factor (CF)** value indicates the degree of confidence in the trend result.
- The **Coefficient of Variation** (CoV) is used to distinguish between a 'No Trend' result and a 'Stable' result for dataset with no significant increasing or decreasing trend.

8.1 Groundwater

All monitoring wells were gauged during both GMEs. Groundwater flow direction is consistent between the two events of the reporting period, indicating a flow direction radial from the sand dunes east of site, where mounding is occurring, which is also consistent with the previous monitoring events. Groundwater elevation can locally be influenced by tidal pressures. This has been considered when monitoring (i.e. wells preferably gauged during outgoing tides) and interpreting the inferred groundwater contours and flow direction.

A total of 32 monitoring wells were monitored for PFAS in November 2020 and June 2021. Findings are summarised in the following sections and results are displayed on the following figures in Appendix A:

- Figures 6 and 6B for the November 2020 event; and
- Figures 8 and 8B for the June 2021 event.

8.1.1 On-site source areas

Groundwater monitoring data recorded between February 2018 and June 2021 was used for the assessment, and plume stability (Mann Kendall analysis) has been calculated to support the interpretation. with outputs presented in Appendix D. Groundwater concentration trends with associated confidence factors for PFOA, PFOS and the sum of PFOS and PFHxS across the on-site source areas are summarised in Table 8-1.

For practicality, GSI (2012) outlines that a "No Trend" result can be considered as evidence that concentrations are not increasing at the relevant sampling location, similar to a "Stable" trend result.

Overall the PFAS concentrations for the on-site source areas monitoring wells are consistent between each GME and historical recorded concentrations.

The highest PFAS concentrations were reported in the wells in the vicinity of the POL Storage Area with wells MW003 and MW119 reporting concentrations for the sum of PFOS and PFHxS above the HEPA (2020) recreational use criteria (see Table 7-3). MW008 historically had reported sum of PFOS and PFHxS above the HEPA (2020) recreational use criteria but has dropped below this level during Nov 2020 and Jun 2021 monitoring events (see Figure 7-1). This is supported by probably decreasing trends calculated for all three analytes reviewed at MW008 with >90% confidence factor. MW003 and MW105 reported new concentration minimums, in addition statistical analysis of PFOS and Sum of PFOS and PFHxS concentrations at MW105 indicates a probably decreasing trend.

At the Powerhouse Area, MW017 located to the southwest of the compound, has consistently recorded sum of PFOS and PFHxS concentrations one order of magnitude above the adopted HEPA (2020) recreational use criteria (see Figure 7-2). The concentration trend for the Sum of PFOS and PFHxS is stable at 86.4% confidence. It is also noted that this location shows a decreasing PFOA trend at 99.2% confidence.

[3] Note: In order to not create 'false trends', a constant value of 0.0005 ug/L (half of the lowest LOR value) was adopted for results below LOR for the Mann Kendall test. Changes in laboratory's LOR can occur depending on the level of detection requested or when sample dilution was required.

PFOA concentrations that were recorded across the on-site source area network were generally above the laboratory LOR, but below adopted human health and ecological assessment criteria. Several wells across both source areas display a decreasing PFOA trend with relatively high confidence factors (>90%).

None of the source area groundwater monitoring locations show a potential increasing trend. This, in conjunction with the decreasing or stable trends observed indicates that the PFAS source areas are not contributing to increase the groundwater PFAS load. The plume appears to be slowly diluted with rainfall recharge and groundwater migration. However, given the ongoing exceedances of adopted ecological and human health guidelines, ongoing monitoring should be continued to confirm these preliminary observations.

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Table 8-1 Mann-Kendall Trend Analysis Summary – On-site Source Areas

Source Area	Location ID	PFOS Trend	Confidence Factor (%)	PFOS Max Conc in Latest Round?	PFOA Trend	Confidence Factor (%)	PFOA Highest Observed in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
POL Storage Area	MW003	No Trend	64.0	No	No Trend	50.0	No	No Trend	76.5	No
	MW008	Probably Decreasing	93.2	No	Probably Decreasing	90.7	No	Decreasing	96.5	No
	MW105	Probably Decreasing	93.2	No	No Trend	86.4	No	Probably Decreasing	93.2	No
	MW119	No Trend	86.4	No	No Trend	81.5	No	Stable	64.0	No
	MW210	Stable	88.1	No	No Trend	66.7	Equal (LOR)	No Trend	88.1	No
	MW212	Stable	37.9	Equal (LOR)	Stable	37.9	Equal (LOR)	No Trend	61.4	Yes
Powerhouse Area	MW017	No Trend	64.0	No	Decreasing	99.2	No	Stable	86.4	No
	MW019	No Trend	76.5	No	Stable	39.3	Equal (LOR)	Decreasing	97.2	No
	MW027	No Trend	50.0	No	Decreasing	98.2	No	Stable	89.8	No
	MW101	No Trend	82.1	No	Stable	75.8	No	Stable	59.2	No
	MW102	Stable	50.0	No	Stable	59.2	No	Stable	88.3	No
	MW103	Stable	57.0	No	Decreasing	95.2	No	Decreasing	97.2	No
	MW104	No Trend	70.3	No	No Trend	76.5	Equal (LOR)	No Trend	70.3	No
	MW123	Stable	75.8	Equal (LOR)	Stable	40.8	Equal (LOR)	No Trend	75.8	Equal (LOR)
	MW214	No Trend	89.8	No	No Trend	86.4	No	No Trend	81.5	No
	MW213	No Trend	89.6	No	Stable	89.6	Equal (LOR)	No Trend	72.9	No

8.1.2 Pathway Areas

A statistical analysis was not conducted for the pathway monitoring wells since a large majority of the results were below the laboratory LOR. It is also noted that a potential seasonal fluctuation is observed for the wells in the POL pathway area with detectable PFAS concentrations generally reported in the June events following the wet season in the Exmouth Peninsula. This could be related to increased groundwater gradient following recharge. The detected concentrations are however only marginally above LOR and generally return below LOR during subsequent events in November. These observations support the theory of a potential plume dilution with concentration generally becoming undetectable before reaching the sensitive receptors.

8.1.3 Broader Area Wells

The broader area wells were sampled for the first time in June 2018, with three wells sampled as part of the OMP. These wells are located to the northwest of the site and could provide early indication of a potential migration of the plume towards the Indian Ocean.

MW129 located between the site and the northwest coastline, reported a new maximum PFOS and PFHxS concentration (0.75 µg/L) in June 2021. The same location also recorded a new minimum (<0.01 µg/L) during November 2020. These results remain within the same order of magnitude as historical data and Mann Kendall analysis for this monitoring well indicates no statistically significant trend. Further monitoring of the broader area and pathway monitoring wells will confirm if these results are outliers or indicators of a plume migration.

Table 8-2 Mann-Kendall Trend Analysis Summary – Broader Area wells

Location	PFOS Trend	Confidence Factor (%)	PFOA Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Trend	Confidence Factor (%)
MW129	No Trend	59.2	No Trend	75.8	No Trend	59.2
MW130	No Trend	59.2	Stable	40.8	No Trend	59.2
MW134	No Trend	75.8	No Trend	75.8	No Trend	75.8

8.2 Seepage Water

All seepage water monitoring locations reported PFAS concentrations below the laboratory LOR during the November 2020 and June 2021 monitoring events with the exception of OTH113 located on the northwest coastline, which recorded a new maximum for sum of PFOS and PFHxS (0.56 µg/L) during the June 2021 event. This result was two order of magnitude above historical data, however, further monitoring data is required to confirm if the June 2021 result is an outlier or indicates a plume migration towards the northwest and warrant a revision of the CSM. Given the results in groundwater at the nearby broader area well MW130 (<LOR), it is more likely that this result is an outlier. It is however noted that MW129 located cross-gradient also reported a new Sum of PFOS and PFHxS maximum in June 2021 (0.75 µg/L). Further sampling is required to confirm potential trends and changes (if any) in the plume extent.

8.3 Surface Water

Surface water is monitored within the main drainage pathway exiting the source areas and at one location within the Powerhouse source area (SW113).

Plume stability (Mann Kendall analysis) has been calculated for surface water sampling location SW113 (Powerhouse). This was the only surface water location that recorded values above LOR during Nov 2020, first flush 2021 and Jun 2021 sampling events. Data recorded between February 2018 and June 2021 was used for the assessment, with outputs presented in Appendix D and a summary provided in Table 8-3 below.

Table 8-3 Mann-Kendall Trend Analysis Summary – Surface Water

Location	PFOS Trend	PFOS Max Conc in Latest Round?	PFOA Trend	PFOA Maximum in Latest Round?	Sum of PFOS & PFHxS Trend	Sum of PFOS & PFHxS Max Conc in Latest Round?
SW113	Decreasing	No	Decreasing	No	Decreasing	No

SW113 showed a decreasing trend for PFOS, PFOA and sum of PFOS & PFHxS with a confidence factor of 99%. All other surface water results were below the laboratory LOR which indicates PFAS migration with surface water is generally not occurring.

8.4 Sediment

Sediment concentrations across the sampling locations since sampling commenced have been below the laboratory LOR with the exception of SD113 located within the Powerhouse source area, which consistently recorded PFOS concentrations above LOR. SD112 also recorded a first time detect of PFOS (0.0003 mg/kg) during the 2021 first flush event. This could be related to increased PFAS mobilisation with surface water run-off/flooding associated with first flush conditions. However, the co-located surface water location (SW112) did not report detectable PFAS concentrations during this monitoring event. It is also noted that all concentrations were recorded below the adopted human health and ecological assessment criteria.

9 Conceptual Site Model

The evaluation of analytical results within this report does not suggest the nature and extent of PFAS in groundwater, surface water or sediment has significantly changed compared to that inferred from previous data.

The understanding of on-site sources and on-site pathway areas presented in the investigation phase (GHD, 2018) is supported by the OMP monitoring data presented in this report. The predominant stability in PFAS trends in groundwater at the on-site wells and boundary/broader area wells also suggests the risk profile of these locations do not appear to be changing significantly.

The pathways for PFAS exposure and risks to human health and ecological receptors presented in the investigation phase (GHD, 2018) are considered to be relevant and data presented in this report does not suggest any significant changes to these mechanisms or risks. It is however noted that during the June 2021 monitoring event, new maximum concentrations were recorded at a seepage water and groundwater monitoring locations (OTH113 and MW129) along the north-western coastline. Further sampling is required to confirm if this indicates a change in the plume extent and CSM understanding or if the results are outliers.

The data presented in this report does not significantly change the understanding of the CSM. Future monitoring will continue to contribute to an evaluation of any potential changes to the CSM understanding.

10 Discussion

10.1 Risk Profile

The ecological risk assessment (ERA) conducted in 2019 (GHD, 2019) determined that:

- PFAS posed a low risk to lower trophic level terrestrial and aquatic organisms across the Management Area;
- PFAS posed a low risk with respect to the potential for bioaccumulation and biomagnification in avian food chains across the Management Area, including the terrestrial environments of the base, the ephemeral clay pan and Exmouth Gulf;
- PFAS posed a low risk with respect to the potential for bioaccumulation and biomagnification in aquatic mammals. While the PFAS concentrations estimated for fish in the nearshore environment of Exmouth Gulf using average detected beach seepage water PFAS concentrations marginally exceeded the NEMP mammalian wildlife diet guideline, the absence of PFOS in the majority (>80%) of beach seepage samples collected, the low rates of groundwater discharge into Exmouth Gulf and the resulting high levels of dilution and dispersion support the conclusion that the concentrations in fish will be much less than estimated; and
- PFAS posed a low risk to marine turtles that nest along the beaches of the Management Area. In particular, the DSI showed that PFAS is largely absent in the unsaturated surface soils of the sandy dune areas, where marine turtle eggs were buried.

It was concluded that the information gathered during the ERA supported the conclusion made in the DSI, that PFAS exposure risks to recreational anglers were low and acceptable across the Management Area. Site-derived PFAS was also found to be unlikely to harm prawn stocks within Exmouth Gulf or to bioaccumulate to potentially harmful levels within the commercial prawn catch of the Exmouth Gulf Managed Prawn Fishery (EGMPF).

The data obtained during the reporting period has been reviewed against the management response triggers presented in the OMP. No trigger was exceeded during the reporting period.

Based on the current available data there is no significant change to this risk profile. Potential changes in groundwater, surface water, seepage water and sediment PFAS concentrations will continue to be evaluated through future monitoring and reporting.

The data evaluated in this report does not indicate changes to the nature and extent of PFAS in groundwater surface water, seepage water and/or sediment which change the understanding of the CSM.

10.2 Triggers for OMP Review

The OMP is reviewed annually considering existing trend data available to tailor the monitoring program to site-specific characteristics. A review of the OMP may be required for several reasons including (but not limited to):

- Policy changes, regulatory requirements or regulator advices;
- Changes or refinements to the monitoring network, frequency and parameters;
- Feedback and information received as part of stakeholder engagement activities;
- A change in the understanding of the risk for the site;
- Significant changes of land use within the Management Area or at close proximity;
- Impacts of remediations works; and
- The requirements of a post-remediation Site Management Plan.

The 2020 - 2021 monitoring results did not identify a change in the risk profile for the Management Area or further management actions that would trigger the need for an OMP review. However, updated guidance has been published since the development of the OMP and updated assessment criteria should be amended in the next revision of the OMP. The OMP will be revised as the initial OMP implementation period has been reached.

11 Conclusions

Groundwater, surface water, seepage water and sediment monitoring and sampling was conducted between November 2020 and June 2021 in accordance with the SAQP (Cardno, 2021). Data from the DSI (GHD, 2018) and previous year of OMP implementation is also included and considered in this report to inform the understanding of the risk.

Overall, the concentrations of PFAS across the media and locations sampled are consistent with historical data. Statistical analysis was undertaken for PFAS results to support the data interpretation.

Groundwater monitoring wells at the source areas displayed either decreasing, stable or the absence of a trend depending on the analyte under review. The plume appears to be slowly diluted with rainfall recharge and groundwater migration. However, concentrations become undetectable (i.e. generally below laboratory LOR) before reaching the sensitive receptor. The pathway and seepage water monitoring locations are indeed, mostly recording undetectable PFAS concentrations.

None of the management response triggers presented in the OMP was exceeded during the reporting period.

The nature and extent of PFAS across all media has not changed from the understanding presented in the investigation phases and the PMAP. Based on the current available data there is no significant change to the risk profile of the Management Area nor the CSM understanding.

The 2020 - 2021 monitoring results did not identify a change in the risk profile for the management area that would trigger the need for an OMP review or further management actions. However, the OMP will be revised as the initial OMP implementation period has been reached.

Given the remaining PFAS concentrations at the on-site source areas (POL Fuel Farm and Powerhouse), and isolated new concentration maximum, the ongoing monitoring program should be continued to provide additional temporal data and plume extent/behaviour to further validate risk findings.

Further monitoring events (as per the OMP initial three-year implementation period) will offer the opportunity to provide a better understanding of the risk associated with PFAS at the Management Area.

12 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. Bureau of Meteorology, Climate Data Online (http://www.bom.gov.au/climate/data/?ref=ftr)
5. *Contaminated Sites Act 2003*, Western Australia.
6. Department of Defence, August 2019, Contamination Management Manual
7. Department of Defence, July 2020, OMP Annual Interpretive Report Guidance, version 0.1
8. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
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18. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
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Site Specific References

20. Cardno, June 2021, Reference: DEF19009, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt A'*.
21. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-Winter, HEH-A. (Cardno, 2021a)
22. Cardno, May 2021, PFAS OMP First Flush Sampling Event Factual Report, HEH-A. (Cardno, 2021b)
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24. Cardno, June 2021, 2020 Annual Interpretive Report, HEH-A – PFAS OMP. (Cardno, 2021d)
25. Department of Defence, March 2019, Naval Communication Station Harold E Holt – 'Area A PFAS Management Area Plan'.

26. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Ongoing Monitoring Plan'

27. GHD Pty Ltd, December 2018, Reference: 3135526,'Naval Communication Station Harold E Holt – Area A PFAS Investigations Detailed Site Investigation Report'.

28. GHD Pty Ltd, April 2019, Reference: 3135526, 'Harold E Holt A Ecological Risk Assessment'.

APPENDIX A

FIGURES

Cardno

now

Stantec

Harold E Holt Area A

North West Cape

Exmouth

Legend

Management Area / Commonwealth boundary

HEHA Site Features

FIGURE 1

1:100,000 Scale at A3

Meters

0 1,500 3,000

Site Location

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HAROLD E HOLT AREA A
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Map Produced by Cardno WA
Date: 2021-12-21 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-001_RegionalLocation 03.mxd
Aerial Imagery Supplied by Google Earth

FIGURE 2

1:25,000 Scale at A3

Meters

0 500 1,000

Management Area

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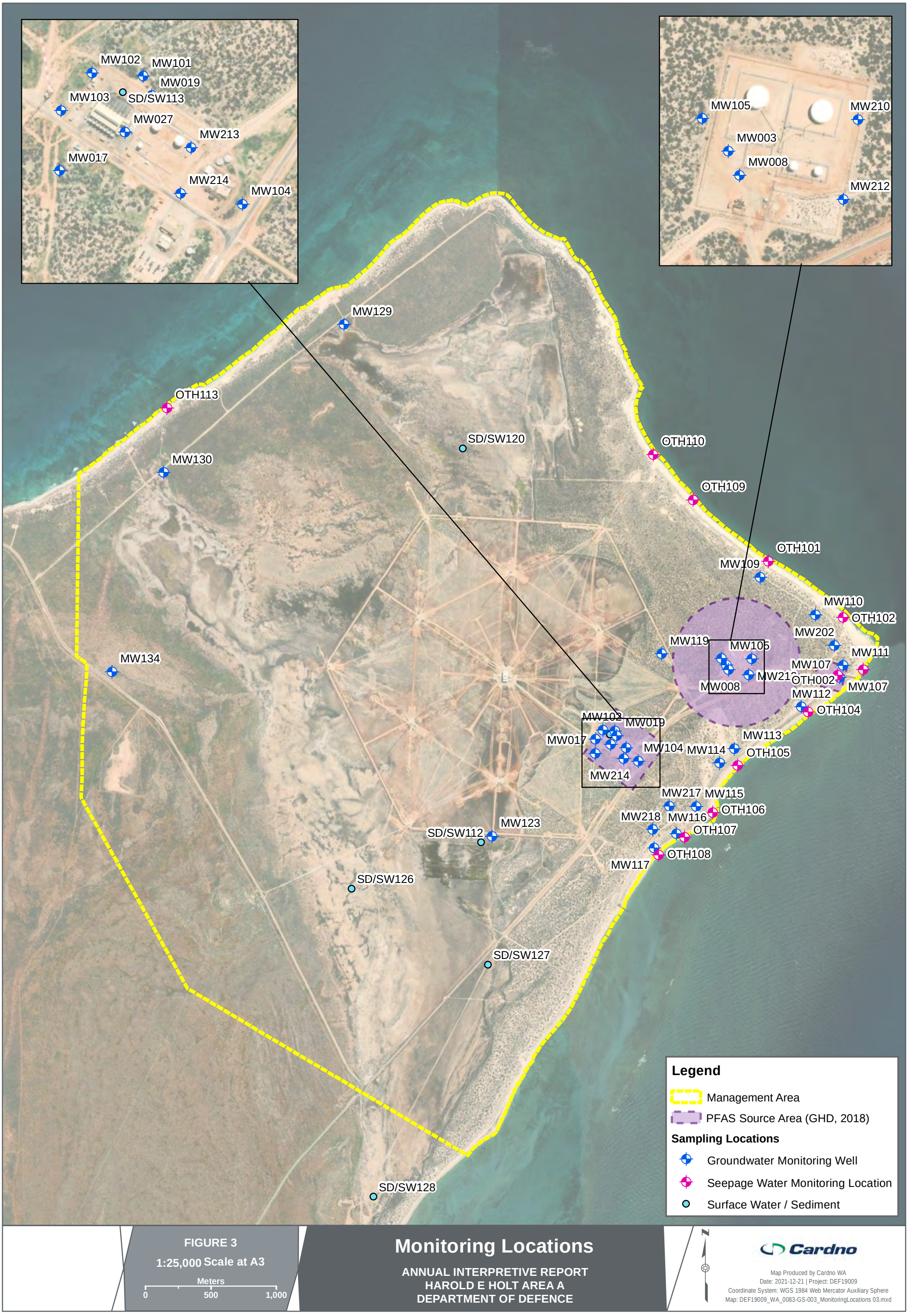
Map Produced by Cardno WA
Date: 2021-12-21 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-002_ManagementAreas 02.mxd


MW102
MW101
MW019
MW103
SD/SW113
MW027
MW213
MW017
MW214
MW104
MW105
MW210
MW003
MW008
MW212
MW129
OTH113
SD/SW120
OTH110
MW130
OTH109
OTH101
MW109
MW110
OTH102
MW202
MW134
MW119
MW105
MW111
MW107
MW213
OTH002
MW107
MW008
MW112
OTH104
MW102
MW019
MW113
MW017
MW104
MW114
OTH105
MW214
MW217
MW115
OTH106
MW218
MW116
MW123
OTH107
SD/SW112
OTH108
MW117
SD/SW126
SD/SW127
SD/SW128
Legend
Management Area
PFAS Source Area (GHD, 2018)
Sampling Locations
Groundwater Monitoring Well
Seepage Water Monitoring Location
Surface Water / Sediment
FIGURE 3
1:25,000 Scale at A3
Meters
0
500
1,000
Monitoring Locations
ANNUAL INTERPRETIVE REPORT
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Map Produced by Cardno WA
Date: 2021-12-21 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-003_MonitoringLocations 03.mxd


MW129 (0.2196)
MW130 (0.173)
MW134 (0.0976)
MW109 (0.2863)
MW110 (0.4087)
MW202 (0.729)
MW111 (0.3329)
MW119 (0.0569)
MW003 (0.243)
MW210 (0.278)
MW212 (0.273)
MW008 (0.236)
MW112 (0.4036)
MW102 (0.2024)
MW019 (-0.025)
MW113 (0.39)
MW214 (0.105)
MW114 (0.2956)
MW017 (0.189)
MW104 (-0.0497)
MW217 (0.128)
MW115 (0.2315)
MW218 (0.14)
MW123 (-0.2344)
MW117 (0.0854)
0.1
0.2
0.3
0.4
0.6
0
-0.1
-0.2
Note: Well gauging data was collected over several days and tide cycles.
This has been considered when interpreting the inferred groundwater contours & direction.
Legend
Management Area
Groundwater monitoring wells (Nov20 RWL, mAHD)
Inferred groundwater contours (mAHD)
Groundwater Flow Direction
FIGURE 4
1:25,000 Scale at A3
Meters
0
500
1,000
Nov-20 Inferred Groundwater Contours
ANNUAL INTERPRETIVE REPORT
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N
Cardno
Map Produced by Cardno WA
Date: 2022-02-11 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-004_Nov-20_GWContours 01.mxd

FIGURE 5

1:25,000 Scale at A3

Meters

0 500 1,000

Jun-21 Inferred Groundwater Contours

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Date: 2021-12-21 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-004_Jun-21_GWContours 01.mxd

MW129
OTH113
SW120
MW130
MW134
SW112
MW123
SW126
SW127
SW128

Figure B

OTH110
OTH109
OTH101
MW109
MW110
OTH102
MW202
MW119
MW105
MW111
MW003
MW107
MW212
OTH103
MW008
MW112
OTH104
MW103
SW113
MW113
MW102
MW104
MW114
OTH105
MW017
MW213
MW217
MW115
OTH106
MW218
MW116
OTH108
MW117

Legend

- Management Area
- PFAS Source Area (GHD, 2018)

Nov-20 PFOS+PFHxS Concentrations

- Not Sampled
- Below LOR
- LOR to 0.07 ug/L
- 0.07 ug/L to 0.7 ug/L
- 0.7 ug/L to 7.0 ug/L
- 7.0 ug/L to 70 ug/L
- >70 ug/L

FIGURE 6

1:25,000 Scale at A3

Meters

0 500 1,000

PFOS+PFHxS Concentrations - Nov-20

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Map Produced by Cardno WA
Date: 2022-07-28 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-005_PFOS+PFHxS_Nov20 01.mxd

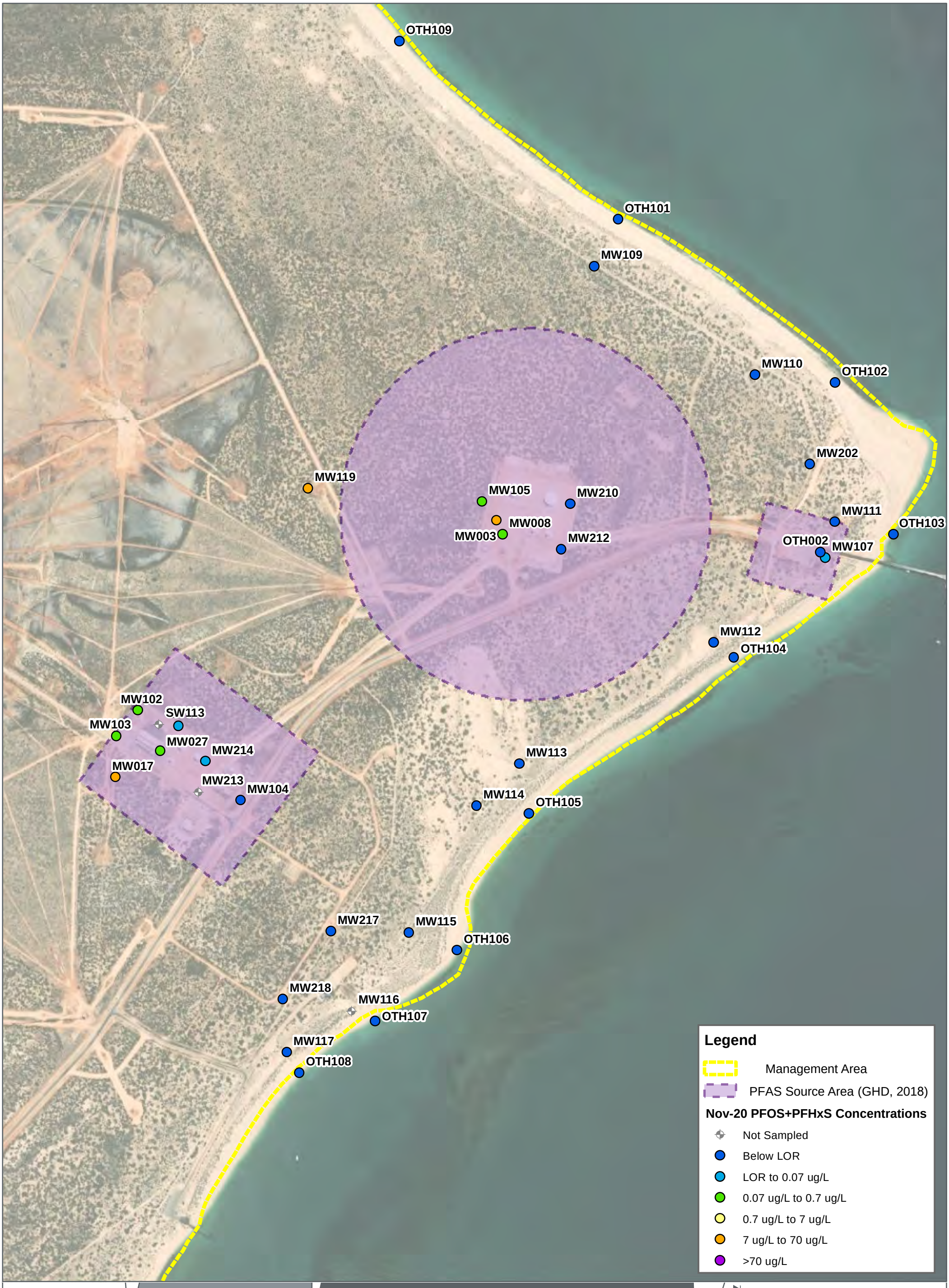

FIGURE 6B

1:9,000 Scale at A3

Meters

0 180 360

PFOS+PFHxS Concentrations - Nov-20

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

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Date: 2022-07-28 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-005B_PFOS+PFHxS_Nov20 01.mxd

FIGURE 7

1:25,000 Scale at A3

Meters

0 500 1,000

PFOS+PFHxS Concentrations - Mar-21

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

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Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-006_PFOS+PFHxS_Mar21 01.mxd

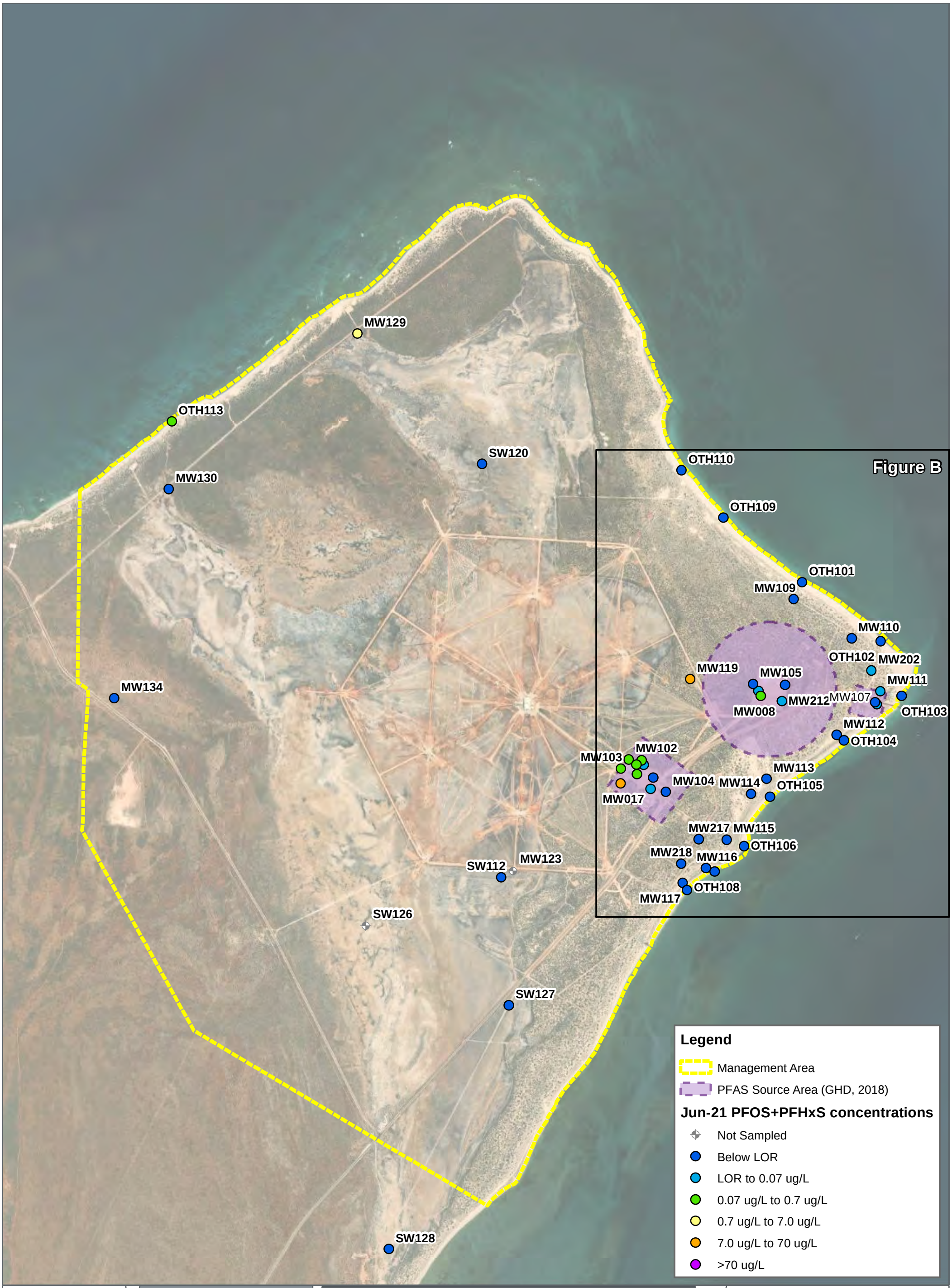

FIGURE 8

1:25,000 Scale at A3

Meters

0 500 1,000

PFOS+PFHxS Concentrations - Jun-21

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

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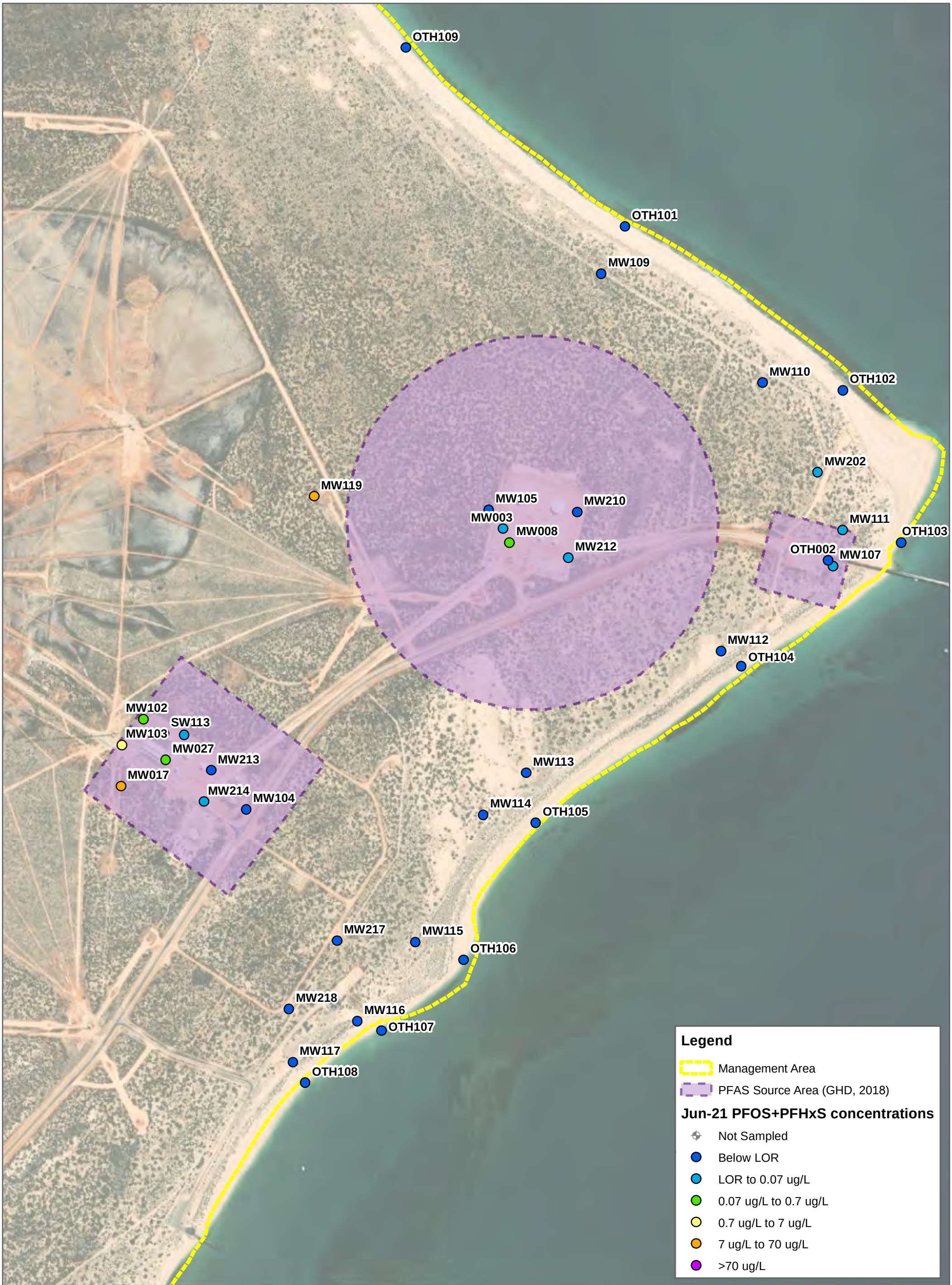
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-007_PFOS+PFHxS_Jun21 01.mxd


OTH109
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MW112
OTH104
MW102
SW113
MW103
MW027
MW213
MW017
MW214
MW104
MW113
MW114
OTH105
MW217
MW115
OTH106
MW218
MW116
OTH107
MW117
OTH108
Legend
Management Area
PFAS Source Area (GHD, 2018)
Jun-21 PFOS+PFHxS concentrations
Not Sampled
Below LOR
LOR to 0.07 ug/L
0.07 ug/L to 0.7 ug/L
0.7 ug/L to 7 ug/L
7 ug/L to 70 ug/L
>70 ug/L
FIGURE 8B
1:9,000 Scale at A3
Meters
0
200
400
PFOS+PFHxS Concentrations - Jun-21
ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE
Cardno
Map Produced by Cardno WA
Date: 2022-07-28 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-007B_PFOS+PFHxS_Jun21 01.mxd

APPENDIX

B

SAQP

Cardno

now

Stantec

PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP)

Naval Communication Station Harold Holt A

Prepared for

Department of Defence

14 June 2021

Cardno

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Appendices

1 Introduction

Cardno have been engaged by the Australian Department of Defence ('Defence' or 'Client') to prepare a Sampling and Analysis Quality Plan (SAQP) as part of the Ongoing Monitoring Plan (OMP), the purpose of which to monitor trends in the extent and concentrations of per- and poly-fluoroalkyl substances (PFAS) impacts identified on and around the Naval Communication Station Harold E Holt - Area A (HEH-A), Exmouth, Western Australia (Figure 1, Appendix A).

The OMP SAQP applies to not only HEH-A, but also the surrounding areas that, together with the Base, make up the "Management Area" (Figure 2, Appendix A). For the purposes of this report:

> "the Site" was defined as Harold E Holt – Area A (Figure 1, Appendix A).

> "the Management Area" was defined as comprising the Site, plus the land extending to the Exmouth Gulf (to the east, north and north-west) (Figure 2, Appendix A).

The Site is located on Commonwealth Land and is regulated under Commonwealth environmental legislation. The OMP outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater, seepage water, surface water and sediment originating from the Site for an initial three-year monitoring period. The monitoring frequency aligns with the climate of the Management Area, which features the highest volume of rainfall typically between January and July and lower rainfall between September and December. An additional wet season sampling event will be undertaken near the start of the wet season in January or February. Only surface water and sediment will be obtained in the January/February event to attempt to obtain first flush samples. Groundwater and seepage water will not be sampled.

1.1 Purpose & Objectives

The objective of the OMP SAQP is to present the specific monitoring locations, sampling methodologies and quality control / quality assurance measures for the monitoring of the concentrations and extent of PFAS in groundwater, seepage water, surface water and sediment originating from the Site. These findings will inform risk management decisions by Defence and the Western Australian Government to protect human health and the environment.

The specific purposes of the monitoring specified in the OMP is to:

1. Evaluate the nature and extent (spatial and temporal) of PFAS impact in groundwater and surface water pathways associated with Site sources of PFAS derived from AFFF;
2. Monitor the migration of PFAS in groundwater and surface water from the Site;
3. Provide confirmation of the current understanding of risk; and
4. Provide supporting data for assessment of management actions, where relevant.

1.2 Previous Reports

The following key reports prepared in relation to the HEH-A PFAS Investigation have been used as a basis to develop this SAQP:

> Department of Defence, March 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Management Area Plan'.

> Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Ongoing Monitoring Plan'

> GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area A PFAS Investigations Detailed Site Investigation Report'.

> GHD Pty Ltd, April 2019, reference: 3135526, 'Harold E Holt A Ecological Risk Assessment'.

> Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter, HEH-A.

> Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report HEH-A.

> Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-summer, HEH-A.

> Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-winter, HEH-A

> Cardno, April 2021, PFAS OMP First Flush Sampling Event Factual Report HEH-A.

> Cardno, April 2021, 2020 Annual Interpretive Report, HEH-A.

1.3 Responsible Parties

Responsible parties and responsibilities associated with the implementation of the OMP are detailed in Table 1-1.

Table 1-1 Responsible Parties

Role	Responsibilities
Department of Defence – Directorate of PFAS Remediation (DPFASR) – Environment & Engineering Branch	▪ Implement this OMP. ▪ Engage suitably qualified environmental consultants/contractors to carry out the works specified in the OMP
HEH-A – Base Support Manager / Site Manager and Environment and Sustainability Manager	▪ Review and approve all necessary permits required for implementation of the works outlined in the OMP.
Environmental Consultant	▪ Obtain necessary permits from HEH-A to implement the works outlined in the OMP. ▪ Liaise with State regulators (e.g. Department of Biodiversity, Conservation and Attractions) to arrange sampling of off-Site waterways, as required. ▪ Undertake the monitoring activities outlined in this SAQP. ▪ Produce a monitoring report that summarises the data and findings of each monitoring event and is consistent with the requirements of this SAQP. ▪ Produce an annual interpretive report including recommendations for any potential changes in the location and frequency of sampling which may be incorporated in the revision of the OMP. ▪ Upload analytical data from each monitoring event to the relevant Defence ESdat database.

1.4 Relevant Guidelines

This SAQP has been prepared in general accordance with the WA *Contaminated Sites Act 2003* (CS Act), applicable industry standards and guidelines relevant to an assessment of this type, and has been formulated in reference to the following:

> National Environment Protection Council (NEPC), 1999, *National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013)* (ASC NEPM).

> Heads of Environmental Protection Authority's Australia and New Zealand (HEPA), January 2020, *PFAS National Environmental Management Plan (NEMP) 2.0*.

> Australian Standard AS 4482-2005 *Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds*.

> Standards Australia 1998. AS/NZ 5667:1998 *Water quality – sampling*.

> Australian and New Zealand Guidelines, 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

> Department of Defence, Department of Energy, 2018, *Quality System Manual Schedule B15*.

> U.S. Environmental Protection Agency (EPA), 2000, '*Guidance for the Data Quality Objectives Process (EPA QA/G-4)*'.

> USEPA, 2002, '*Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.*

- Department of Environment and Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*[1].
- National Health and Medical Research Council (NHMRC), August 2019, *Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water*.

1.5 Standards of Assessment and Limitations

This SAQP has been prepared in general accordance with the current industry standards for an assessment of this type for the purpose, objectives and scope identified in this report.

The scope presented in this SAQP report are derived only from available desk-based information and site inspection undertaken. This SAQP is not any of the following:

- A Mandatory Audit Report (MAR) or Voluntary Audit Report (VAR) as defined under the *Contaminated Sites Act 2003* (CS Act).
- A Geotechnical Assessment.
- A Detailed Site Investigation (DSI).
- A Detailed Hydrogeological Assessment.
- A Remediation Action Plan (RAP) or Site Remediation & Validation (SRV) report.
- A Site Management Plan (SMP).

2 Site Description and Management Areas

HEH-A is located approximately 1,250 km north of Perth, 14 kilometres north of Exmouth township, and covers an area of 2,310 hectares (ha). HEH-A was established in 1967 and is host to a VLF antenna field and associated infrastructure including a central transmitter building, power station, fuel farms, fuel pipelines, Murat Pier and saltwater bore field.

The Site is situated at the end of the North West Cape of WA, at the northern edge of Exmouth. HEH-A encompasses the waters extending 400 m around the Point Murat Pier. The majority of the buildings and associated infrastructure and support services are located in the eastern portion of the Site and include:

- VLF transmitter Station.
- Bulk fuel storage, referred to as the Petrol Oil Lubricants (POL) store.
- Bulk fuel storage at the ready use fuel farm (RUFF) above ground storage tanks (ASTs) at the power station
- Point Murat Pier – diesel fuel supplied by ships berthed at Point Murat Pier and transferred via pipeline (above and below ground) to the POL and ready storage facility adjacent to the power station
- Power station

2.1 Site Definition and Planning

For the purposes of this SAQP report, “the Site” is defined as comprising HEH-A. The site location is presented on Figure 1, Appendix A. Key Site identification details are presented in Table 2-1.

[1] It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site locations.

Table 2-1 Site Identification Details

Details	Description
Site Address	Murat Rd, North West Cape, WA 6707
Land Description	Harold E Holt Area A
Owner	Commonwealth of Australia
Title Details	Lot 44 on Plan P209471
Planning Zone / Land use	Public Purposes – Government Services
Local Government Authority (LGA)	Shire of Exmouth
Boundary corner coordinate (1) **(eastings and northings in GDA94, Zone 50)**	▪ North corner: 201,817 mE, 7,588,922 mN ▪ East corner: 209,638 mE, 7,585,003 mN ▪ South corner: 206,410 mE, 7,581,168 mN ▪ West corner: 203,378 mE, 7,585,914 mN

(1) As determined by Cardno

2.2 Surrounding Land Uses and Zoning

The surrounding land uses are outlined in Table 2-2.

Table 2-2 Surrounding Land Uses

Direction	Land Use
North	Ningaloo Marine Park
West	Ningaloo Marine Park
East	Ningaloo Marine Park/Exmouth Gulf, commercial prawn fishing
South	Bundegi Coastal Park and vacant crown land (open space)

3 Environmental Setting

Key details defining the site are summarised in Table 3-1.

Table 3-1 Key Site Details

Setting	Description
Climate	The region has a hot, semi-arid climate, with a wet and dry season. The maximum temperatures range between 37.9ºC (January) and 24.2ºC (July) while minimum temperatures range between 11.4ºC (July) and 24.7ºC (February). Rainfall occurs generally between January and July with monsoonal showers between January and Late April. August to December is generally dry. The highest volume of rainfall typically occurs during the month of June with a mean monthly rainfall amount of 43.5 mm.
Topography	Elevation across HEH-A typically range between 1 and 20 meters relative to the Australian Height Datum (m AHD). To the East of HEH-A, the coastline is comprised of sand dunes which have a maximum elevation of 20 mAHD. The dunes have a succession profile of primary and secondary dunes, which increase in elevation with distance from the coast.
Geology	**Regional Geology** The Site is underlain by the geological units of the Northwest Cape range primarily comprising carbonate sediments. The Cape Range Group consists in: ▪ Trealla Limestone: permeable, hard and tightly jointed limestone beneath unconsolidated Quaternary deposits. Contains both karst areas and areas of recrystallization.

Setting	Description
	▪ Tulki Limestone: relatively permeable, hard and tightly jointed. Encountered at depths of 50 to 100 m below ground level (mbgl). Karst features such as caves occur within the recrystallised limestone. ▪ Mandu Limestone: low permeability limestone encountered at greater than 150 mbgl. ▪ The Birdrong Sandstone which underlies the Cape Range Group, comprising a fine to coarse grained silty sandstone. **Site Specific Geology** Previous environmental investigations have reported that the geology at HEH-A is primarily a clay pan, comprising silt, sand and gravels. The clay pan encompasses the majority of the far north eastern tip of the peninsula and is fringed along the coast to the north and east of the Site by extensive beach and coastal dunes.
Acid Sulfate Soil	A review of the Acid Sulfate Soils (ASS) risk mapping, available on the WA Atlas online database indicates that most of the area encompassing the site is classified as having either a high to moderate or moderate to low risk of ASS occurring.
Hydrology	HEH-A can be inundated by sea water during extreme storm surges. Later evaporation of this water has left visible salt crusts and localised hypersaline conditions. The coastal send dunes and inland topographical depression that characterise HEH-A, effectively form a basin where, in the absence of drainage pathways to the coast, surface water can stand for up to several months following substantial rainfall events and storm surges. Site drainage primarily follows the local topography, prior to infiltration into the ground surface.
Hydrogeology	The Quaternary and Tertiary-aged sediments are hydraulically interconnected and together form the major, unconfined aquifer of the area. The superficial Quaternary layers (dunes, colluvium, alluvium) are considered to be no more than 20 m in thickness. ▪ **Groundwater Occurrence/Quality** – The main regional aquifer occurs predominantly within the Tulki Limestone (within permeable beds and the karst system) on the flanks of the Cape Range and the Mandu Limestone (within joints and minor permeable beds) on the crest of the Cape Range. The aquifer is unconfined and is recharged by rainfall. Groundwater in the Quaternary units is considered to be perched and discontinuous. The coastal dunes may also contain relatively fresh groundwater, however of limited extent (lenses), but may influence groundwater flow directions locally. The groundwater underlying the clay/salt pan is hypersaline due to the clay pan acting as an evaporation basin where salts are concentrated. Brackish groundwater conditions exist around the power station and POL areas, which may indicate an interaction with fresher recharge source. ▪ **Depth to Groundwater** – Groundwater has previously been recorded beneath the site at shallow levels of between -0.128 and 0.675 m AHD (i.e. less than 7 m below ground level) (GHD, 2018). The hydraulic gradient of the site is low (in the order of 0.0002 to 0.003 m/m). The groundwater is therefore likely to be vulnerable to local changes in flow direction through preferential recharge. ▪ **Groundwater Flow Direction** – The groundwater elevation contour pattern (GHD, 2018) indicated a generally consistent groundwater flow direction from the sand dunes towards the central clay pan area (i.e. westerly direction for eastern portions of the Base, and easterly flow direction on the west). ▪ **Groundwater Use** – No registered groundwater bores were identified within a 1 km radius of HEH-A. A number of unregistered extraction bores are understood to be present at residential properties within the township of Exmouth, located approximately 14 km south of the Site. – Saltwater production bores are installed within the Trealla Limestone to the south-east of the power plant compound area. Groundwater is continuously pumped from this borefield, which may be responsible for localised deviations in the groundwater elevation contours near the south-east portion of the site. ▪ **Protective Drinking Water Source Area (PDSA**) – The site is not located within a PDSA, The Exmouth Water Reserve drinking water source protection review Area, a Priority 1 area, is located approximately 12 km southwest of the Site at its closest point. Priority 1 areas are usually undeveloped and under state management.

Setting	Description
	▪ **Receiving Surface Water Body** – A component of flow from the sand dunes towards the coast is present on the eastern coats near Murat Pier, although this is reversed at high tide, such that groundwater discharges over full tidal cycles may be minimal. Previous investigations reported a very low hydraulic gradient for the Site.
Environmental Sensitive Areas	The Site occurs within an area that is included on the Register of the National Estate because of its natural heritage value, under the Australian Heritage Council Act 2003 of the Commonwealth. ▪ The Cape Range Subterranean Waterways wetlands occurs across the Site. ▪ The Cape Range National Park is located approximately 16 km to the southwest of the Site at its closest point. ▪ The Jurabi Coastal Park is adjacent to the west of the Site. ▪ The Bundegi Conservation Reserve is adjacent to the southeast of the Site. ▪ The Ningaloo Coast, a World Heritage listed site is located within 10km of HEH-A. The Ningaloo Coast is also listed on the National Heritage Property register.
Wetlands	▪ The Site occurs within the Cape Range subterranean Waterways wetland, listed under the Directory of Important Wetlands.
Further information can be found in the DSI report (GHD 2018).	

4 Source Areas and Risk

The Site has been subject of numerous PFAS investigation reports, including:

> Coffey 2011, limited Groundwater Monitoring Event Report - Naval Communication Harold E Holt: Area A and Area B,

> Aurecon 2016, limited Groundwater Monitoring Event Report - Naval Communication Harold E Holt: Area A and Area B.

> A Preliminary Site Investigation and Sampling Analytical and Quality Plan (GHD 2018 PFAS Site Investigations Naval Communication Station Harold E Holt – Preliminary Site Investigation and Sampling Analytical and Quality Plan);

> A Detailed Site Investigation (GHD December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area A PFAS Investigations Detailed Site Investigation Report').

> An Ecological Risk Assessment (GHD 2019).

4.1 Source Areas

Three main source areas were identified at the Base. These included the Petrol Oil and Lubricant (POL) storage area, Powerhouse and, to a lesser extent, Murat Pier (Figure 2, Appendix A). Detectable concentrations of PFAS were identified in all environmental media tested – soils, sediments, surface water (where present) and groundwater.

5 Data Quality Objectives

Development of data quality objectives (DQOs) for the OMP SAQP is based on guidance presented in the ASC NEPM (NEPC 2013) and are consistent with 'Naval Communication Station Harold E Holt Area A PFAS Ongoing Monitoring Plan' (2019). The DQO process comprises the following seven steps:

> Step 1: State the problem

> Step 2: Identify the decision/principal study question(s)

> Step 3: Identify the Inputs into the Decision

> Step 4: Study Boundaries

> Step 5: Decision rules

> Step 6: Tolerable limits on decision errors

> Step 7: Optimisation of the data collection process

The DQOs are detailed in Table 5-1.

Table 5-1 Data Quality Objectives

Data Quality Step	Description
State the Problem	The DSI (GHD 2018) identified PFAS in groundwater, surface water and sediment within the Management Area at concentrations exceeding the relevant assessment levels. The highest concentrations were mostly contained to, around the source areas. The DSI together with the subsequent preliminary ERA (GHD, 2019) reported that the presence of PFAS on and in the areas surrounding the Base were of low risk to receptors. **Groundwater and seepage water** PFAS was detected in groundwater on both the north and the west site of the Site. PFAS concentrations in groundwater vary both vertically within the groundwater profile and laterally across the Site. Although groundwater flow is generally inland, radial flow to the coast may occur at times of flooding of the salt pan. PFAS **Surface Water** PFAS concentrations in surface water exceeding human health screening levels protective of recreational uses have been identified in a number of areas across the site including the powerhouse and POL fuel farm. **Sediment** In general, PFAS concentrations in surface soils were higher in the source areas; however, the concentrations were below the screening criteria relevant to ecological or human health risks with the exception of three sample locations at the POL Fuel farm. Sediment can however be mobilised into surface drains and can migrate off-site to Exmouth Gulf. PFAS sorbed to sediments are also prone to dissolution in surface waters. There are currently no Australian endorsed assessment levels for PFAS in sediment. Current data for the majority of sampling locations is limited to one or two sampling events. Whilst the findings of the Preliminary ERA (GHD, 2019) recognised that an adverse ecological impact is unlikely, a robust dataset is required to assess trends in the nature, extent and magnitude of PFAS concentrations within sediment, surface water and groundwater to validate/improve the understanding of the CSM in relation to spatial and temporal variability of PFAS concentrations within the Management Area and associated receptors.
Identify the decision/principal study question(s)	This OMP is to provide further data to assess the following principal study questions: ▪ What are the changes and trends in the nature, extent and magnitude of PFAS concentrations in the groundwater, surface water and sediment within the Management Area? ▪ Has the nature, extent and magnitude of PFAS concentrations changed significantly to warrant a revision of the level of risk? ▪ Has the nature, extent and magnitude of PFAS concentrations changed significantly to warrant refinement of any existing management measures?
Identify the Inputs into the Decision	The following inputs are required to resolve the principal study questions outlined in Step 2: ▪ PFAS concentrations in groundwater, surface water and sediment from previous and future monitoring events. ▪ Field data (i.e. groundwater levels, physico-chemical parameters) on groundwater, surface water and sediment from previous and future monitoring events. ▪ An appropriate statistical evaluation of the data (e.g. using Mann-Kendall or similar analysis) including short- and long-term trends, in particular for surface water and groundwater concentrations. ▪ Comparison of data sets to relevant endorsed assessment levels (refer to Section 7).

Data Quality Step	Description
Study Boundaries	Ongoing monitoring will generally be undertaken within the boundaries of the Management Area (Figure 2, Appendix A) at the groundwater, surface water, seepage and sediment monitoring locations outlined in Sections 6.3.1 and 6.4.1. Monitoring will be undertaken every six months, with one monitoring event post-summer (June) and one post-winter (November) during an initial implementation period of three years. An additional surface water and sediment monitoring event will take place following the first flush immediately (or as close as possible) following the first heavy rainfall event of the wet season (January or February). Section 6.3 provides further detail on the monitoring frequency.
Develop a Decision Rule	▪ The analytical and field data will be used to assess changes to the nature, extent and magnitude of PFAS in surface water, sediment and groundwater and to provide supporting data for assessment of management actions, where relevant. ▪ Trends in PFAS concentrations, including an assessment of temporal and spatial changes, will be assessed using an appropriate statistical analysis approach (e.g. using Mann- Kendall, GWSdat or similar analysis), with a specified level of confidence based upon the number of monitoring rounds completed. ▪ The analytical data will be compared to the relevant assessment levels (presented in Section 7) and/or historic concentrations (i.e. maximum concentration) recorded during prior monitoring rounds [i.e. during the DSI (GHD 2018)] to evaluate changes in the risk profile and whether revision of the risk level or implemented management measures is warranted. Where exceedances of adopted assessment criteria levels (presented in Section 7) or new detections are reported, further interrogation of data will be undertaken to the extent relevant to assess the risk profile and location. A summary of the key decision rules as detailed below: 1. Have the analytical data collected as part of the monitoring program met the DQI (refer Table 5-2.below)? If yes, then the data can be used to answer the decision rule below and the decision statements developed in Step 2. If no, then an assessment of the need to collect additional data will be required. 2. Do PFAS concentrations exceed the investigation criteria? If no, then the contamination would be considered not to pose an unacceptable risk. Where results exceed the adopted investigation criteria, this may not necessarily indicate an unacceptable level of risk. Further risk assessment, and potentially additional investigations, will be required to determine the potential for unacceptable impacts. 3. Has PFAS been detected in any of the off-site bores previously not detected? If yes, do PFAS concentrations reported indicate an increasing trend and/or exceed historic maximum concentrations? Do results indicate a potential risk to associated receptors (e.g. local ecosystems) including associated risks that PFAS may present towards human receptors. Further risk assessment, and potentially additional investigations, will be required to determine the potential for unacceptable impacts. 4. Has PFAS been detected in onsite drainage channels and offsite seepage water within the management areas? If yes, do PFAS concentrations reported indicate an increasing trend or exceed historic maximum concentrations? Do results indicate a potential risk to receptors and changes to the risk profile? Further risk assessment, and potentially additional investigations, will be required to determine the potential for unacceptable impacts. Annual Interpretative Report will review the results obtained against these triggers/decisions.
Specify Limits on Decision Error	The potential for significant decision errors will be minimised by completing a robust QA/QC program in accordance with DER and NEPM guideline requirements. Standard operating procedures will be closely followed in the field to ensure accurate and representative data acquisition. DQIs will be applied to assess usability of data prior to making decisions, based on precision, accuracy, representativeness, comparability and completeness. The acceptable limit on decision error is 95% compliance with the applied DQIs (see Table 5-2). If any of the DQIs are not met, further assessment will be necessary to evaluate the significance of the non- conformance and any corrective actions.

Data Quality Step	Description
Optimise the Design for Obtaining the Data	The design of the OMP has been made in consideration of historical activities at the site, historical investigations (and findings i.e. PSI, DSI and ERA), in the context of developing responses to the principal study questions outlined in Step 2 and to meet the DQOs ensuring that a representation of the current site condition can be achieved. The OMP scope for the first three years of monitoring is outlined in Section 6. Following initial implementation (and review following each monitoring event), the available data will be reviewed and evaluated to determine if the frequency of monitoring should increase or decrease to provide better understanding of PFAS concentration fluctuations and potential risks to receptors. As additional information is gathered during the course of this investigation/monitoring, it may be beneficial for the proposed scope of works to be altered from the initial design. Changes to the proposed monitoring, if considered necessary, will be made based on risk profile reviews and updated CSM and in consultation with the Client Other factors that will optimise the design for obtaining data will include the use of laboratories that are NATA accredited for PFAS analysis and ensure laboratory LORs are suitable to meet the relevant adopted assessment levels (where possible), experienced field scientist(s), robust field and laboratory quality assurance/quality control protocols are adopted and Field and analytical data are collected in accordance with the PFAS NEMP 2.0 (HEPA 2020), ASC NEPM (NEPC 2013) and the assessment of contaminated sites (DER 2014).

An assessment of the Data Quality Indicators (DQIs) relating to both field and laboratory procedures will be undertaken with appropriate documentation provided for each environmental element or media assessed. The DQIs adopted for the DSI are summarised in Table 5-2.

Table 5-2 Data Quality Indicators

Data Quality Indicator	Detail
QA Documentation	Provision of appropriate work plans, DQI and DQO defined for the site and all QA/QC aspects documented.
Bias	A measure of the potential distortion in an analysis which can result in errors in one direction (e.g. one laboratory consistently higher results or consistent poor spiked matrix recovery). Bias will be assessed with reference to the analysis of spiked matrix samples (NEPC 1999b).
Representativeness	A qualitative measure of the confidence that data is representative of each medium present on the site. Use of appropriate and documented sampling methods, sampling handling, preservation and transport and holding times.
Precision:	A quantitative measure of data variability or reproducibility, measured by the calculation of %RPD values for duplicate samples (i.e. measure of agreement). Precision in DQI is considered an important assessment in an environmental study (USEPA, 2002, Guidance on Environmental Data Verification and Data Validation). It can be measured as follows: ▪ Percentage of the mean of the measurement such as Relative Percent Difference (i.e. %RPD). The %RPD will be calculated for the field and secondary duplicate (i.e. inter and intra-laboratory analysis); and ▪ Use of similar analytical method and instrument (e.g. for inter-laboratory assessment). The %RPD will be considered as acceptable if the values are:

Magnitude of result	Acceptable RPD range
<10 x limited of reporting (LOR)	No limits
10 – 20 x LOR	0% - 50%
>20 x LOR	0% - 20%

▪ Should there be a result that is greater than acceptable RPD range, then a “review should be conducted of the cause (e.g. instrument calibration, appropriateness of method used)” (NEPC, 2013).

Data Quality Indicator	Detail
	For the purpose of this OMP, field and secondary duplicates should be collected at a rate of 1 in 10 samples (HEPA 2020 and GHD, 2018).
Accuracy	A quantitative measure of the closeness of data to a 'true value', measured by the analysis of spike, blank and laboratory control samples (LCS). The LCS consists of a standard reference material or a matrix of known concentration. For the purpose of assessing accuracy it is required that at least one LCS for each process batch [2] be analysed (NEPC, 2013).
Comparability	A qualitative measure of the confidence that data may be considered to be equivalent for each sampling and analytical event. By use of standard procedures, comparable methods, qualified personnel and review of sample integrity.
Completeness	A measure of the amount of usable data (expressed as a percentage - %) from a data collection activity, based on completeness of test program, overall QA/QC completeness and validity of data set.

6 Ongoing Monitoring Program

6.1 OMP SAQP History

The changes made to the OMP SAQP since the Rev1 are documented in Table 6-1.

Table 6-1 OMP SAQP History

SAQP Version	Date	Report Section	Changes	Justification
Rev 2	18/06/2020	7	Update of assessment criteria and reference to HEPA (2020). Well ID update as per DCARM update	New guideline (HEPA, 2020) DCARM update
Rev 3	14/05/2021	6.3	Table 'Wells construction details' added.	Defence review
		6	Methodology tables updates	
Rev 4	14/06/2021	-	Correct typos throughout and minor updates	Defence review

6.2 Management Area Description

The OMP includes sampling and analysis not only from the Base, but also from a number of surrounding (off-Site) waterways, groundwater bores and seepage locations. The Site and these surrounding areas are collectively referred to as the "Management Area". The Management Area boundaries are presented on Figure 2, Appendix A.

The 'Management Area' includes:

> The source Areas (as described in Section 4.1)

> Land surrounding the Base to the coastline.

[2] The NEPM Schedule B3 – *Guideline on Laboratory Analysis of Potentially Contaminated Soil* defines a laboratory process batch to consist of up to "*20 samples that are similar in term of matrix and test procedure, and are processed as one unit for the QC purposes*" (NEPC, 2013).

6.3 Groundwater Monitoring

6.3.1 Groundwater Monitoring Network

The groundwater monitoring network, sampled as part of the DSI (GHD 2018), includes 46 single level monitoring wells and 16 multilevel wells. The network of groundwater monitoring locations are summarised in Table 6-2 and Table 6-3.

Table 6-2 HEH-A Groundwater Monitoring Network (single-level)

Area	Average screen interval (mBGL)	Monitoring Well / Bore ID
Powerhouse	2.0 – 6.0	MW213; MW027; MW101; MW102; MW103; MW019; MW021; MW205; MW215; MW126;
Fuel Farm	2.0 – 5.0	MW218; MW210; MW211; MW212; MW003; MW006; MW007; MW008; MW023;
Powerhouse pathway	3.0 – 6.0	MW012; MW013; MW014 MW015; MW017 MW214; MW217; MW218;
Fuel farm pathway	2.0 – 5.0	MW202; MW010; MW020; MW024;
Broader area	2.0 – 5.0	MW001; MW009; MW118; MW119; MW120; MW121; MW122; MW123; MW124; MW125; MW127; MW128; MW131; MW133; MW134

Table 6-3 HEH-A Groundwater Monitoring Network (Multi - Level)

Well ID	Screen interval (mBGL)	Time Sampled	Concentration Range (GHD, 2018)		
			Sum of PFHxS + PFOS (µg/L)	PFOS (µg/L)	PFOA (µg/L)
0083_MW104	3.5 – 4.0	1	0.004	**0.001**	ND
	5.5 – 6.0	2	0.002 – 0.005	ND – **0.002**	ND – 0.003
	7.5 – 8.0	2	ND – 0.002	ND – **0.002**	ND – 0.001
	9.5 – 10.0	2	ND	ND	ND
0083_MW105	2.0 – 2.5	1	1.2	**0.68**	0.29
	4.0 – 4.5	2	0.2 – 0.25	**0.15** – **0.20**	0.007 – 0.021
	6.0 – 6.5	2	0.11 – 0.2	**0.040** – **0.067**	0.004 – 0.02
	8.0 – 8.5	2	ND – 0.038	**0.007** – **0.008**	0.002 – 0.003
0083_MW106	4.5 – 5.0	1	0.002	**0.002**	ND
	6.5 – 7.0	1	ND	ND	ND
	8.5 – 9.0	1	ND	ND	ND
0083_MW107	3.1 – 4.1	1	0.4	**0.22**	0.016
	5.5 – 6.0	2	ND – 0.004	**0.004** – **0.013**	ND
	7.5 – 8.0	2	0.1 – 0.177	**0.088** – **0.15**	0.003 – 0.008
0083_MW108	2.0 – 2.5	1	0.082	**0.028**	0.009
	3.7 – 4.2	2	0.521 – 0.6	**0.081** – **0.12**	0.032 – 0.037
	5.5 – 6.0	2	0.3 – 0.33	**0.020** – **0.04**	0.013 – 0.014

Well ID	Screen interval (mBGL)	Time Sampled	Concentration Range (GHD, 2018)		
			Sum of PFHxS + PFOS (µg/L)	PFOS (µg/L)	PFOA (µg/L)
0083_MW109	6.5 – 7.0	2	ND	<0.0002	ND
	9.3 – 9.8	2	ND – 0.002	<0.0002 – **0.002**	ND
0083_MW110	7.5 – 8.0	2	ND – 0.002	<0.0002	ND
	9.0 – 9.5	2	ND – 0.007	<0.0002 – **0.004**	ND – 0.002
0083_MW111	8.5 – 9.0	2	ND – 0.004	**0.002** – **0.007**	ND – 0.001
	10.5 – 11.0	2	ND – 0.009	**0.006** – **0.012**	ND
0083_MW112	2.0 – 3.0	2	ND – 0.009	**0.005** – **0.007**	ND
	4.5 – 5.0	2	ND	<0.0002	ND
	6.5 – 7.0	2	ND	<0.0002 – **0.002**	ND
	8.5 – 9.0	2	ND – 0.001	<0.0002 – **0.001**	ND
0083_MW113	2.5 – 3.5	2	ND	<0.0002	ND
	5.0 – 5.5	2	ND	<0.0002	ND
	7.0 – 7.5	2	ND	<0.0002	ND
0083_MW114	2.0 – 3.0	2	ND – 0.002	<0.0002	ND
	4.5 – 5.0	2	ND	<0.0002	ND
	6.5 – 7.0	2	ND – 0.002	<0.0002 – **0.002**	ND
	8.5 – 9.0	2	ND	<0.0002	ND
0083_MW115	2.0 – 3.0	2	ND – 0.002	<0.0002	ND
	4.5 – 5.0	2	ND	<0.0002	ND
	6.5 – 7.0	2	ND	<0.0002	ND
	8.5 – 9.0	2	ND	<0.0002	ND
0083_MW116	1.2 – 2.2	2	ND – 0.003	<0.0002 – **0.003**	ND – 0.001
	4.5 – 5.0	2	ND – 0.002	<0.0002 – **0.002**	ND – 0.001
	6.5 – 7.0	2	ND – 0.002	<0.0002 – **0.002**	ND – 0.001
	8.5 – 9.0	2	ND – 0.003	<0.0002 – **0.003**	ND
0083_MW117	2.0 – 2.5	2	ND	<0.0002	ND
	4.0 – 4.5	2	ND	<0.0002	ND
	6.0 – 6.5	2	ND – 0.002	<0.0002 – **0.002**	ND – 0.001
	7.4 – 7.9	2	ND	<0.0002	ND
0083_MW129	1.5 – 2.0	1	0.012	**0.008**	0.007
	5.5 – 6.0	1	0.016	**0.010**	0.011
	9.5 - 10	1	0.006	**0.018**	0.016
	13.5 – 14	1	0.03	**0.002**	0.014
0083_MW130	1.4 – 1.9	1	ND	<0.0002	ND
	3.4 – 3.9	1	0.007	**0.005**	ND
	5.4 – 5.9	1	0.005	**0.003**	ND

Well ID	Screen interval (mBGL)	Time Sampled	Concentration Range (GHD, 2018)		
			Sum of PFHxS + PFOS (µg/L)	PFOS (µg/L)	PFOA (µg/L)
	7.4 – 7.9	1	0.005	**0.005**	ND

Notes:

1. ND: Non Detected = concentration below laboratory limit of reporting
2. **Bold** = exceeds adopted assessment criteria (99% species protection level for fresh and marine water)

It is proposed to monitor a representative sub-set of the monitoring wells as part of the OMP. The groundwater wells and bores selected for monitoring are presented in Table 6-4, along with the rationale for the selection, and are shown on Figure 3, Appendix A. For the multilevel monitoring wells, only the shallowest (non-dry) screened intervals will be sampled. Seepage water sample locations were chosen to assess the inferred groundwater discharge zone along the coast and are shown on Figure 3, Appendix A.

Table 6-4 OMP Groundwater and Seepage water Monitoring Locations

Area	Monitoring Well / Bore ID	Rationale (OMP, 2019)
Powerhouse	0083_MW017; 0083_MW027; 0083_MW213; 0083_MW214; 0083_MW104; 0083_MW101; 0083_MW102; 0083_MW103; 0083_MW019; 0083_MW123	Monitoring of these wells will provide a confirmation of overall PFAS impact identified in the DSI (GHD, 2018). Assessment of overall changes in PFAS concentration in the source areas to provide temporal data on depletion of the source zone.
Fuel Farm	0083_MW119; 0083_MW105; 0083_MW003; 0083_MW008; 0083_MW212; 0083_MW210	
Powerhouse pathway	0083_MW218; 0083_MW117; 0083_MW217; 0083_MW116; 0083_MW115; 0083_MW114; 0083_MW113 **Seepage water** 0083_OTH108; 0083_OTH107; 0083_OTH106; 0083_OTH105	Monitoring of these wells will provide a confirmation of overall PFAS impact identified in the DSI (GHD, 2018). Assessment of changes in PFAS concentration and distribution in the main migration pathways. This will also allow for early detection of significant changes in migration so contingencies can be put in place. **Seepage water** Assessment of changes in PFAS concentration at the receptor downgradient from the source area.
Fuel farm pathway	0083_MW109; 0083_MW112; 0083_MW110; 0083_MW202; 0083_MW107; 0083_MW111 **Seepage water** 0083_OTH101; 0083_OTH104; 0083_OTH103	
Broader area	0083_MW134; 0083_MW130; 0083_MW129 **Seepage water** 0083_OTH113; 0083_OTH110; 0083_OTH109; 0083_OTH102	Confirmation of the presence of low level PFAS in the wider environment.
Murat Pier salt water discharge water	**Seepage water** 0083_OTH002	Assessment of possible seasonal changes in water discharged to Exmouth Gulf, which comes from the salt water bore field and the powerhouse water treatment system.

Notes:

1. *Source: Defence, PFAS Investigation and Management Branch, May 2019, reference: Naval Communication Station Harold E Holt Area A PFAS Ongoing Monitoring Plan*

Construction details for the groundwater wells monitored as part of the OMP are provided in Table 6-5.

Table 6-5 OMP Groundwater Monitoring Wells Construction Details

Well ID	Date drilled	Easting[1]	Northing[1]	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
MW003	2005	208545.27	7584922.39	3.263	5	2.0 – 5.0
MW008	2005	208561.35	7584889.07	2.846	5.5	2.5 – 5.5
MW017	2005	207623.43	7584280.07	3.421	6	3.0 – 6.0
MW019	2005	207775.71	7584407.8	2.955	4.5	1.5 – 4.5
MW027	2005	207731.82	7584346.08	4.499	6	3.0 – 6.0
MW101	2018	207761.021	7584439.324	2.4356	4.5	2.0 – 4.5
MW102	2018	207675.073	7584443.695	2.6924	6	1.0 – 6.0
MW103	2018	207623.767	7584380.205	2.7898	6	1.0 – 6.0
MW104	2018	207930.918	7584229.719	4.0042	4	3.5 – 4.0
				3.9903	6	5.5 – 6.0
				3.9853	8	7.5 – 8.0
				3.9635	10	9.5 – 10.0
MW105	2018	208509.293	7584967.659	3.1221	2.5	2.0 – 2.5
				3.1082	4.5	4.0 – 4.5
				3.0979	6.5	6.0 – 6.5
				3.1131	8.5	8.0 – 8.5
MW107	2018	209352.4198	7584846.3728	4.7144	4.1	3.1 – 4.1
				4.7014	6	5.5 – 6.0
				4.7447	8	7.5 – 8.0
MW109	2018	208773.8324	7585546.1806	7.0426	7	6.5 – 7.0
				7.0413	9.8	9.3 – 9.8
MW110	2018	209172.62	7585288.7584	8.2665	8	7.5 – 8.0
				8.2807	9.5	9.0 – 9.5
MW111	2018	209374.6344	7584934.0695	8.8279	11	10.5 – 11.0
				8.8159	9	8.5 – 9.0
MW112	2018	209082.826	7584635.075	3.0835	3	2.0 – 3.0
				3.0636	5	4.5 – 5.0
				3.0211	7	6.5 – 7.0
				3.0986	9	8.5 – 9.0
MW113	2018	208612.641	7584330.663	2.970	3.5	2.5 – 3.5
				2.9108	5.5	5.0 – 5.5
				2.9418	7.5	7.0 – 7.5
MW114	2018	208509.621	7584226.733	2.9356	3	2.0 – 3.0
				2.9516	5	4.5 – 5.0
				2.9674	7	6.5 – 7.0
				2.9852	9	8.5 – 9.0
MW115	2018	208349.605	7583914.745	2.6281	3	2.0 – 3.0

Well ID	Date drilled	Easting[1]	Northing[1]	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
				2.6415	5	4.5 – 5.0
				2.6786	7	6.5 – 7.0
				2.6909	9	8.5 – 9.0
MW116	2018	208211.574	7583720.685	2.3875	2.2	1.2 – 2.2
				2.3885	5	4.5 – 5.0
				2.4312	7	6.5 – 7.0
				2.4417	9	8.5 – 9.0
MW117	2018	208055.731	7583617.473	2.5910	2.5	2.0 – 2.5
				2.6554	4.5	4.0 – 4.5
				2.7296	6.5	6.0 – 6.5
				2.7619	7.9	7.4 – 7.9
MW119	2018	208082.439	7584992.646	3.5069	5.1	2.1 – 5.1
MW123	2018	206901.211	7583678.814	0.5356	4.5	0.5 – 4.5
MW129	2018	205780.981	7587282.904	2.0256	2	1.5 – 2.0
				2.0119	10	9.5 – 10.0
				2.0047	6	5.5 – 6.0
				1.9957	14	13.5 – 14.0
MW130	2018	204518.718	7586211.014	2.0160	1.9	1.4 – 1.9
				2.0555	3.9	3.4 – 3.9
				2.0791	5.9	5.4 – 5.9
				2.0866	7.9	7.4 – 7.9
MW134	2018	204175.564	7584792.928	10.0786	12.5	6.5 – 12.5
MW202	1995	209311.08	7585073.67	8.069	9.9	6.9 – 9.9
MW210	2011	208731.85	7584966.2	2.863	4	1.5 – 4.0
MW212	2011	208706.86	7584855.31	3.513	4	1.0 – 4.0
MW213	2011	207842.89	7584322.76	4.490	5.5	2.5 – 5.5
MW214	2011	207826.46	7584246.08	4.290	5.5	2.5 – 5.5
MW217	2011	208158.1	7583914.64	3.658	4.5	1.2 – 4.5
MW218	2011	208043.65	7583746.95	5.137	5.8	2.8 – 5.8

6.3.2 Monitoring Frequency

All groundwater monitoring locations listed in Table 6-4 will be sampled every six months for the three years initial implementation period. Sampling will be undertaken post-summer (June) and post-winter (November) to record the concentration and extent of PFAS and determine any seasonal fluctuations or trends.

6.3.3 Groundwater Sampling Methodology

Groundwater sampling methodology are detailed in the following sections.

6.3.3.1 Groundwater Monitoring Wells and Seepage Water

Groundwater monitoring will be undertaken by no purge HydraSleeve® method for the single-level wells, while the multilevel wells will be sampled with a peristaltic pump and seepage water sampling will be conducted through methodology consistent with the 2018 DSI, as detailed in Table 6-6.

Table 6-6 Groundwater Monitoring Wells – Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) will be gauged using an interface probe. All wells will be measured against a specified mark at the top of the well casing. A sub-selection of wells will be gauged during the same tidal period for the purpose of generating the inferred groundwater contours.
Groundwater Field Parameters	For the single level wells, the field parameters will be recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. For the multilevel wells, the field parameters will be recorded with a flow through cell during purging. The following field parameters will be recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement will be recorded on field data records. All field instruments (e.g. water quality meter) will be calibrated by the equipment supplier and daily readings of reference solutions (bump tests) completed to optimise the accuracy of the measurements taken.
Deployment and Retrieval of HydraSleeves (single level well sample collection)	HydraSleeve will be deployed with top weight sample collection to begin at the lowest point. HydraSleeve sampling devices will be left in wells for a minimum of 4 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment. Samples will be collected via continuous pull method at a rate allowing the water to pass through the check value into the sample sleeve. Samples will be discharged immediately (minimise changes in chemistry) via discharge tube.
Peristaltic pump (multi-level well sample collection)	The shallowest (non-dry) wells will be sampled at each location using Teflon-free dedicated and disposable high-density polyethylene (HDPE) tubing coupled to a peristaltic pump system. The groundwater will be purged at a low flow rate of 0.2 L/min. Near-continuous monitoring of SWL and field parameters will be undertaken during purging and post sample collection to ensure limited drawdown effects. The groundwater will be sampled when the field parameters have stabilised, or before drawdown reaches a maximum of 30 cm.
Alternative sampling methodology (hand bailing)	Disposable HDPE hand bailers, attached to a polypropylene string, will be used in the event that the water column isn't sufficient to fill the hydrasleeve. Purging of the well (removal of 3x well volume) will be undertaken prior to sampling to ensure that a sample representative of the aquifer is taken.
Seepage Water Sampling[1]	Sampling will be carried out in a two-hour period; one hour each side of the low tide. Sampling protocol will involve a shallow excavation in the beach sand; just above where inundation by wave action is occurring. In-situ water parameters will be measured from water seeping into the excavation using a calibrated water quality meter following purging (using a dedicated syringe or jug). Sampling containers will be lowered into the exposed seepage water and filled.
Field Records	Field records will include the following information: ▪ Sampling time, date and name of the sampler. ▪ Weather conditions. ▪ Sample Collection method. ▪ Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.

Activity	Details
	▪ Calibration and daily bump tests records. All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures will be retained within project files.
Decontamination procedure	Dedicated HydraSleeves will be used at each groundwater bore thus removing the need for decontamination. All re-usable sampling equipment will be thoroughly washed using PFAS-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample will be labelled with the sample location, date, project identification number and sampler's initials. Samples will be collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation. Sample containers, preservation procedures, sample storage requirements and holding times will be undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate). ▪ All holding times will comply with the requirements set out in "Australian Standard AS/NZS 5567.1:1998 and AS 4482.1".
Laboratory Testing	▪ Full PFAS analytical suite (see Appendix B). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance) ▪ Dissolved Organic Carbon (DOC), Total suspended solids (TSS), total dissolved solids (TDS) and pH.
Laboratory Testing – Quality Control	▪ Groundwater QC samples will be collected at the following frequencies as detailed in the OMP (DoD, 2019): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples should be sent to a secondary laboratory. ▪ Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)]. ▪ Field blank samples at 1 per day.
Laboratory Accreditation and Limits of Reporting	All groundwater analysis will be undertaken by laboratories accredited by the NATA. ▪ Primary analysis will be undertaken by ALS Global Laboratories (Perth) ▪ Secondary analysis will be undertaken by Eurofins (Perth). Laboratory LORs will be suitable to meet the relevant adopted assessment levels (0.01 µg/L).

Notes:

1. Cardno notes that the seepage water sampling method detailed in the SAQP is not consistent with the OMP as per Defence directions (via email RE: Justification of time and costs for seepage and multi-level well sampling [SEC=UNCLASSIFIED] dated 11 November 2019)

6.4 Surface Water and Sediment Monitoring

6.4.1 Monitoring Locations

Several surface water and soil locations were sampled as part of the DSI (GHD 2018) on and off-site including:

> On-Base drainage channels.

> On-Base source areas.

> The clay pan areas

It is proposed to monitor a representative sub-set of the surface water and sediment locations as part of the OMP. The locations selected for monitoring are presented in Table 6-7 along with the rationale for the selection, and are highlighted on Figure 3, Appendix A.

Table 6-7 OMP Surface Water and Sediment Monitoring Locations

Area	Surface water Sampling Location ID	Sediment Sampling Location ID	Rationale (GHD, 2019b)
Broader area	0083_SW126; 0083_SW128; 0083_SW120; 0083_SW112; 0083_SW127	0083_SD126, 0083_SD128, 0083_SD120, 0083_SD112, 0083_SD127	Confirmation of the presence of low level PFAS in the wider environment.
Powerhouse	0083_SW113	0083_SD113	Confirmation and monitoring of the presence of PFAS in surface water overflowing on to the roadway.

Source: Defence, PFAS Investigation and Management Branch, May 2019, reference: Naval Communication Station Harold E Holt Area A PFAS Ongoing Monitoring Plan

6.4.2 Surface Water and Sediment Monitoring Frequency

The surface water and sediment monitoring locations listed in Section 6.4.1 will be sampled three times per year, as follows:

> Post-summer (June) and post-winter (November) to record the concentration and extent of PFAS and determine any seasonal fluctuations or trends. This monitoring frequency aligns with the climate of the Management Area, which features the highest volume of rainfall typically between January and July and lower rainfall between September and December. This sampling should be conducted in conjunction with the groundwater/seepage monitoring described in Section 6.3

> An additional monitoring event will be conducted immediately (or as close as possible) following the first heavy rainfall event of the wet season in January or February, involving sampling of surface water and sediment locations described in Table 6-7. This would serve to assess the potential increase in PFAS surface water concentrations following 'first flush' rainfall and subsequent timeframe for attenuation to 'long-term average' concentrations.

6.4.3 Surface Water Sampling Methodology

The methodology for the surface water monitoring is detailed in Table 6-8.

Table 6-8 Surface Water Monitoring

Item	Details
Field parameters	Surface water physiochemical parameters (i.e. pH, electrical conductivity (EC), oxidation reduction potential (ORP), dissolved oxygen (DO), and temperature) will be recorded at the time of sampling using a pre-calibrated water quality meter. Field observations such as odours or sheen presence must also be recorded on field sampling sheets.
Sampling Method	Surface water samples will be collected directly into sample containers using a 'Grab' (manual) sample method via a long-handled sampling device. Where depth permits, the sample container should be positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films. Samples will be decanted into the laboratory supplied sample containers. Samples will be collected in accordance with Australian/New Zealand Standards (AS/NZS 5667.1:1998) '*Water quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples*'.
Sample Collection	Water samples will be placed directly into appropriately labelled, laboratory supplied sample bottles and packed in chilled containers for delivery to the laboratory under Chain of Custody documentation.

Item	Details
Decontamination	All re-usable sampling equipment will be thoroughly washed using PFAS-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation, transport and holding times.	Each sample will be labelled with the sample location, date, project identification number and sampler's initials. Samples will be contained in appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation. Sample containers, preservation procedures, sample storage requirements and holding times will be undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate). ▪ All holding times will comply with the requirements set out in "Australian Standard AS/NZS 5567.1:1998 and AS 4482.1".
Field Records	Field records will include the following information: ▪ Sampling time, date and name of the sampler. ▪ Weather conditions. ▪ Sample Collection method. ▪ Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised. ▪ Calibration and daily bump tests records. All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures will be retained within project files.
Laboratory Testing	Surface water samples will be analysed for the following: ▪ Full PFAS analytical suite (see Appendix B). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride sulfate, alkalinity and ionic balance) ▪ DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	Surface water QC samples will be collected at the following frequencies as detailed in the SAQP: ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples should be sent to a secondary laboratory. ▪ Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)].
Laboratory Accreditation and Limits of Reporting	All surface water analysis will be undertaken by laboratories accredited by the NATA. ▪ Primary analysis will be undertaken by ALS Global Laboratories (Perth) ▪ Secondary analysis will be undertaken by Eurofins (Perth). Laboratory LORs will be suitable to meet the relevant adopted assessment levels (0.01 µg/L).

6.4.4 Sediment Sampling Methodologies

The methodology for sediment sampling is detailed in Table 6-9.

Table 6-9 Sediment Investigation Methodology

Item	Details
Sample Collection	Sediment samples will be collected at the sediment/water interface using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under Chain of Custody documentation. At each sampling location, the sediment sample will be visually assessed and observations (including physical description) recorded on field data sheets.
Field Records	Field records will include the following information:

Item	Details
	▪ Sampling time, date and name of the sampler. ▪ Weather conditions. ▪ Sample Collection method. ▪ Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised. All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures will be retained within project files.
Decontamination	All re-usable sampling equipment will be thoroughly washed using PFAS-free detergent, then double rinsed with clean water before the sample collection.
Laboratory Testing	Sediment samples will be analysed for the following: ▪ Full PFAS analytical suite (see Appendix B). ▪ TOC, EC, CEC and pH
Laboratory Testing – Quality Control	Sediment QC samples will be collected at the following frequencies as detailed in the SAQP: ▪ Field duplicate (intra-laboratory) samples at 1 per 10 sediment samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 sediment samples should be sent to a secondary laboratory.
Laboratory Accreditation and Limits of Reporting	All surface water analysis will be undertaken by laboratories accredited by the NATA. ▪ Primary analysis will be undertaken by ALS Global Laboratories (Perth) ▪ Secondary analysis will be undertaken by Eurofins (Perth). Laboratory LORs will be suitable to meet the relevant adopted assessment levels (0.005 mg/kg).

7 Assessment Criteria

7.1 Groundwater and Surface Water

The assessment levels adopted for groundwater and surface water in this OMP are based upon the Heads of Environmental Protection Authorities Australia and New Zealand (2020) PFAS National Environmental Management Plan 2.0 (NEMP; HEPA 2020) and finding of previous site assessment i.e. Detailed Site Investigation (DSI) (GHD 2018). The adopted assessment criteria for groundwater, seepage water and surface water are detailed in Table 7-1.

Table 7-1 Criteria for Groundwater and Surface Water

Location	Adopted Assessment Criteria	
Groundwater	**Human Health**	**Ecological**
On-Site and Off-Site	**Recreational Use:** ▪ PFOS + PFHxS – 2.0 µg/L ▪ PFOA – 10 µg/L	**99% species protection level for fresh and marine water:** ▪ PFOS – Laboratory LOR* ▪ PFOA – 19 µg/L
Surface Water	**Human Health**	**Ecological**
Off-Site	**Non potable use of groundwater (NPUG) and Recreational Use:** ▪ PFOS + PFHxS – 2.0 µg/L ▪ PFOA – 10 µg/L.	**99% species protection level for fresh and marine water:** ▪ PFOS – Laboratory LOR* ▪ PFOA – 19 µg/L

*The criterion of 0.00023 µg/L is lower than the laboratory level of reporting (LOR) and is somewhat impractical. However, the PFAS NEMP 2020 allows for the adoption of the laboratory LOR as a screening level rather than a quantified measurement.

7.1.2 Sediment

It is noted that there are currently no Australian regulatory endorsed assessment levels for risk posed to ecology or human health by PFAS in sediment. Sediments will therefore be assessed with reference to the soil assessment criteria detailed in the PFAS NEMP 2.0 (HEPA, 2020). The adopted assessment criteria for sediments are detailed in Table 7-2.

Table 7-2 Criteria for Sediment

Receptor	Adopted Assessment Criteria
Ecosystems	**Ecological direct exposure (interim guidelines)** ▪ PFOS – 1 mg/kg ▪ PFOA – 10 mg/kg
	Ecological indirect exposure (interim guidelines) ▪ PFOS – 0.01 mg/kg
Human Health	**Commercial / industrial (on-base activities)** ▪ PFOS + PFHxS – 20 mg/kg ▪ PFOA – 50 mg/kg

8 Reporting

8.1 Factual Reporting

A factual report should be produced at the completion of each monitoring event that summarises the data and findings of each monitoring event. Each factual report will present the findings and contain the following information:

> Introduction

> Scope of work completed.

> Description of sampling methodologies used.

> Field observations (e.g. condition of monitoring wells, description of purged water) and water quality parameter measurements.

> Summary of any changes to the monitoring network condition that may affect data integrity, or require rectification works, and recommendations for repair, replacement of decommissioning of a location

> Evaluation of the applicability of adopted assessment levels.

> Review of the suitability of the data for assessment purposes (QA/QC evaluation).

- Summary tables presenting gauged groundwater and surface water levels.
- Presentation of inferred groundwater contours and inferred groundwater flow direction in a figure.
- Summary tables of analytical results in comparison to adopted assessment levels.
- Graphs showing historical concentrations of PFOS, PFOA and PFOS plus PFHxS.
- Laboratory reports, Chain of Custody (CoC) documentation, field sampling records, data validation and QA/QC details, equipment calibration certificates and other relevant documentation.

In the event that further investigation, management and/or remediation are required, recommendations will be presented in a separate 'technical memorandum'.

8.2 Interpretative Reporting

Upon completion of each year's monitoring period an interpretative report will be prepared. As a minimum, each interpretative report should include the following:

- The factual information described in Section 8.1.
- Evidence of compliance with the requirements of the SAQP and meeting stated objectives of the OMP.
- Relevant figures depicting sampling locations and site-specific hydrogeological features.
- Laboratory results and analysis including comparison with relevant screening criteria as identified in each OMP.
- Assessment and commentary on appropriate Quality Assurance/ Quality Control (QA/QC) procedures.
- Assessment against the management triggers and contingencies listed in the OMP.
- A discussion of analytical results in relation to the following:
  - Trends in PFAS concentrations, including an assessment of temporal changes and/or changes to the extent of PFAS impacts. Trends should be assessed using an appropriate statistical analysis approach (e.g. using Mann-Kendall or similar analysis), with a specified level of confidence based upon the number of monitoring rounds completed.
  - Consideration, based on data trends, as to whether any of the existing remediation / management measures should be re-assessed, with a view to potential modification, supplementation or cessation.
  - Assessment of whether changes to the CSM and/or risk assessment are required.
  - Whether recalibration or changes to the groundwater model are required to provide a better understanding of the potential future extent of PFAS impact in groundwater.
- Based on the data obtained, an assessment of the OMP sampling requirements with a view to establishing whether:
  - The number of locations monitored could be reduced, such as where PFAS concentrations are stable and are considered to present a low risk to receptors.
  - Additional monitoring locations are required, including the installation of new monitoring wells or sampling of additional existing wells (and/or private bores) to provide better understanding of the nature, extent or magnitude of PFAS impacts in a particular portion of the Management Area.
  - The frequency of monitoring should increase or decrease to provide better understanding of PFAS concentration fluctuations and potential risks to receptors.
  - Monitoring of additional media should be included in the OMP. *For example, if monitoring of surface water demonstrates a trend of increasing PFAS concentrations, or if concentrations significantly greater than those recorded in previous investigations are recorded, then the requirement to conduct monitoring of aquatic biota should be considered (DoD, 2019).*
- An overview of remedial works or construction and maintenance activities undertaken in the management area during the reporting period, which may impact the CSM
- A statement as to whether the risk profile has changed overall, or for any specific location at the Site, and a recommendation as to whether this should trigger an OMP and/or PMAP review, or other action.

9 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. Contaminated Sites Act 2003, Western Australia.
5. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
6. Department of Environment Regulation (DER), 2014, Assessment and Management of Contaminated Sites.
7. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (https://maps.water.wa.gov.au/#/webmap/gwm).
8. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, 'Guidance on Environmental Data Verification and Data Validation'.
9. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
10. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
11. National Health and Medical Research Council (NHMRC) (2011 – updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
12. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
13. Standards Australia/Standards New Zealand (1998) AS5667.1:1998 'Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and *handling of samples'*.
14. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
15. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

Site Specific References

16. Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter, HEH-A.
17. Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report HEH-A.
18. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-summer, HEH-A.
19. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-winter, HEH-A
20. Cardno, April 2021, PFAS OMP First Flush Sampling Event Factual Report HEH-A.
21. Cardno, April 2021, 2020 Annual Interpretive Report, HEH-A.
22. Department of Defence, March 2019, Naval Communication Station Harold E Holt – Area A 'Management Area Plan'.
23. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Ongoing Monitoring Plan'
24. GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area A PFAS Investigations Detailed Site Investigation Report'.
25. GHD Pty Ltd, April 2019, reference: 3135526, 'Harold E Holt A Ecological Risk Assessment'.

APPENDIX

A

Figures

FIGURE 1

1:100,000 Scale at A3

Meters

0 1,500 3,000

Site Location

SAMPLING AND ANALYSIS QUALITY PLAN
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-001_RegionalLocation 03.mxd
Aerial Imagery Supplied by Google Earth

FIGURE 2

1:25,000 Scale at A3

Meters

0 500 1,000

Management Area

SAMPLING AND ANALYSIS QUALITY PLAN
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

N

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-002_ManagementAreas 02.mxd

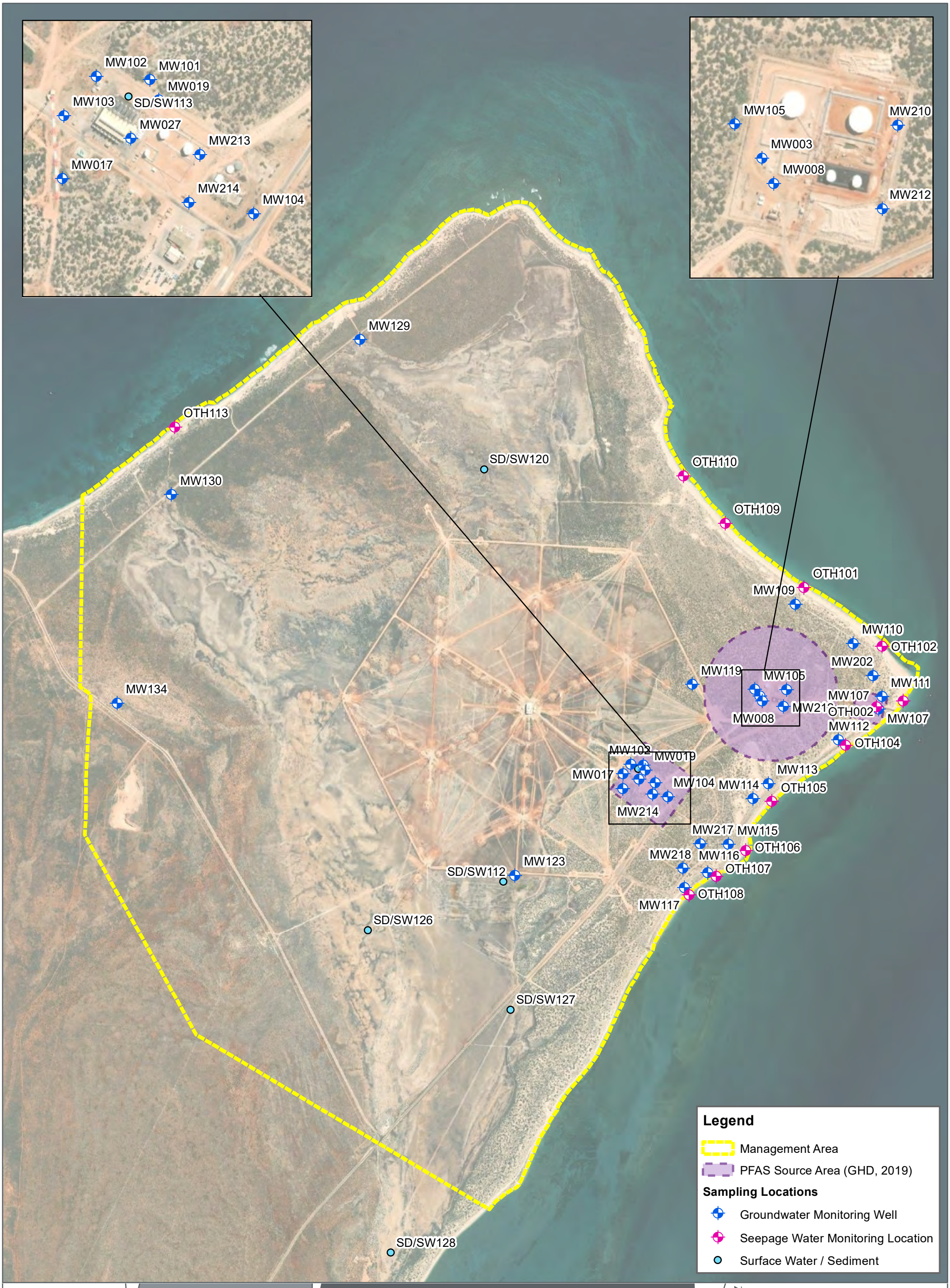

FIGURE 3

1:25,000 Scale at A3

Meters

0 500 1,000

Monitoring Locations

SAMPLING AND ANALYSIS QUALITY PLAN
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-003_MonitoringLocations 03.mxd

APPENDIX

B

Full PFAS Analytical Suite

Full PFAS Analytical Suite

Group	Analyte	CAS No.
Perfluoroalkane Sulfonic Acids	Perfluorobutane sulfonic acid (PFBS)	375-73-5
	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4
	Perfluorohexane sulfonic acid (PFHxS)	355-46-4
	Perfluoroheptane sulfonic acid (PFHpS)	375-92-8
	Perfluorooctane sulfonic acid (PFOS)	1763-23-1
	Perfluorodecane sulfonic acid (PFDS)	335-77-3
Perfluoroalkane Carboxylic Acids	Perfluorobutanoic acid (PFBA)	375-22-4
	Perfluoropentanoic acid (PFPeA)	2706-90-3
	Perfluorohexanoic acid (PFHxA)	307-24-4
	Perfluoroheptanoic acid (PFHpA)	375-85-9
	Perfluorooctanoic acid (PFOA)	335-67-1
	Perfluorononanoic acid (PFNA)	375-95-1
	Perfluorodecanoic acid (PFDA)	335-76-2
	Perfluoroundecanoic acid (PFUnDA)	2058-94-8
	Perfluorododecanoic acid (PFDoDA)	307-55-1
	Perfluorotridecanoic acid (PFTrDA)	72629-94-8
	Perfluorotetradecanoic acid (PFTeDA)	376-06-7
Perfluoroalkyl Sulfonamides	Perfluorooctane sulphonamide (FOSA)	754-91-6
	N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8
	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2
	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7
	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2
	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9
	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6
(n:2) Fluorotelomer Sulfonic Acids	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0

About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD

APPENDIX

C

FACTUAL REPORTS

Cardno

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Stantec

PFAS OMP Biannual Monitoring Event Factual Report

2020 Post Winter

Naval Communication Station Harold E Holt Area A

Prepared for

Department of Defence

19 February 2021

Cardno

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Senior Environmental Engineer

David James
Principal/Regional WA Project Manager

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0.0	7/01/2021	Internal Draft	MB	DJ
Rev 0	11/01/2021	Client Submission / Review	MB	DJ
Rev 1	01/02/2021	Revision 1	AB	MB
Rev 2	19/02/2021	Revision 2	MB	DJ

Table of Contents

Appendices

Tables

Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl Substances
PFHxS	Per-fluoro-hexane Sulphonate
PFOA	Per-fluoro-octanoic Acid
PFOS	Per-fluoro-octane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TOC	Total Organic Carbon
TSS	Total Suspended Solids

Technical Terms

AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
BGL	Below Ground Level
COC	Chain of Custody
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

HEH-A	Naval Communication Station Harold E Holt Area A
OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence ("the Client") to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) biannual sampling event at the Naval Communication Station Harold E Holt - Area A ("HEH-A" or "the Site"). The Site is situated at the end of the North West Cape of WA, at the northern edge of Exmouth (Figure 1, Appendix A).

The OMP was carried out in accordance with the scope and limitations presented in Cardno's Sampling and Analysis Quality Plan (SAQP):

> Cardno, 18 June 2020, Reference: DEF19009, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt A'*.

The SAQP was reviewed prior to the monitoring event and no changes were required.

For the purposes of this report:

> "the Site" was defined as Harold E Holt – Area A.

> "the Management Area" was defined as comprising the Site, plus the land extending to the Exmouth Gulf (to the east, north and north-west) (Figure 2, Appendix A).

1.2 Purpose & Objectives

The objective of the OMP is to assess the changes in the nature and extent of PFAS within the environment, specifically where there is an identified potentially elevated risk to a receptor or a potential future risk to a receptor associated with Defence's historical use of legacy Aqueous Film Forming Foam (AFFF).

The purpose of this PFAS OMP factual report is to provide an up-to-date status of the condition of the site as it is currently understood in relation to the most recent sampling event.

The objectives of the report are:

> To provide a succinct summary of the 2020 post-winter sampling event and provision of analytical results with supporting tables and figures.

> To provide confirmation of the current understanding of risk.

> To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

This assessment has been undertaken in general accordance with applicable industry standards for a site investigation for the purpose, objectives and scope identified in this report. These standards are set out in:

> National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).

> Heads of Environmental Protection Authority's Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.

> Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds.

> Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.

> Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

> Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites[1].

> Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.

> U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.

> USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

> National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

Cardno carried out the tasks detailed in the following sections in order to satisfy the purpose and objectives of this assessment.

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The groundwater bores monitored as part of the OMP are presented in Table 2-1, and are shown on Figure 4, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
Powerhouse	0083_MW017; 0083_MW027; 0083_MW213; 0083_MW214; 0083_MW104; 0083_MW101; 0083_MW102; 0083_MW103; 0083_MW019; 0083_MW123
Fuel Farm	0083_MW119; 0083_MW105; 0083_MW003; 0083_MW008; 0083_MW212; 0083_MW210
Powerhouse pathway	0083_MW218; 0083_MW117; 0083_MW217; 0083_MW116; 0083_MW115; 0083_MW114; 0083_MW113
Fuel farm pathway	0083_MW109; 0083_MW112; 0083_MW110; 0083_MW202; 0083_MW107; 0083_MW111
Broader area	0083_MW134; 0083_MW130; 0083_MW129

2.2 Seepage Water Monitoring

Sampling of selected seepage water monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The seepage water locations monitored as part of the OMP are presented in Table 2-2 and are shown on Figure 4, Appendix A.

Table 2-2 Seepage Water Monitoring Locations

Monitoring Area	Location ID
Powerhouse pathway	0083_OTH108; 0083_OTH107; 0083_OTH106; 0083_OTH105
Fuel farm pathway	0083_OTH101; 0083_OTH104; 0083_OTH103
Broader area	0083_OTH113; 0083_OTH110; 0083_OTH109; 0083_OTH102
Murat Pier salt water discharge water	0083_OTH002

[1] It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site private properties and waterways.

2.3 Surface water Monitoring

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The surface water locations monitored as part of the OMP are presented in Table 2-3 and are shown on Figure 4, Appendix A.

Table 2-3 Surface water Monitoring Locations

Monitoring Area	Location ID
Broader area	0083_SW126; 0083_SW128; 0083_SW120; 0083_SW112; 0083_SW127
Powerhouse	0083_SW113

2.4 Sediment Monitoring

Sampling of selected sediment monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The sediment locations monitored as part of the OMP are presented in Table 2-4 and are shown on Figure 5, Appendix A.

Table 2-4 Sediment Monitoring Locations

Monitoring Area	Location ID
Broader area	0083_SD126, 0083_SD128, 0083_SD120, 0083_SD112, 0083_SD127
Powerhouse	0083_SD113

2.5 Data Management

All the data included in the Report has been collected, uploaded to the ESdat database and reviewed according to the data management requirements of the DCMM Annex L.

The sample naming convention detailed in the DCMM Annex L was used in the field.

2.5.1 Defence ESdat database

Data collected as part of the 2020 post-winter OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- All field data collected was uploaded;
- Laboratory data was uploaded and approved; and
- QA/QC data was reconciled.

2.6 Deviations from the OMP SAQP

Deviations from the SAQP (Cardno, 2020) for the 2020 post-winter monitoring event are presented in Table 2-5

Table 2-5 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
MW213	Not sampled	This groundwater monitoring bore was found dry.
MW116	Not sampled	This groundwater monitoring bore was found locked with a padlock.
SW113, SW120, SW126, SW127, SW128.	Not sampled	These surface water monitoring locations were found dry

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken applying the methods detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) were gauged using an interface probe. All wells were measured against a specified mark at the top of the well casing.
Groundwater Field Parameters	Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records. All field instruments (e.g. water quality meter) were calibrated by the equipment supplier to optimise the accuracy of the measurements taken. Calibration certificates are provided in Appendix D.
Deployment and Retrieval of HydraSleeves (single level well sample collection)	HydraSleeve were deployed with top weight sample collection to begin at the lowest point. HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment. Samples were collected via continuous pull method at a rate allowing the water to pass through the check value into the sample sleeve. Samples were discharged immediately (minimise changes in chemistry) via discharge tube. Following sampling, hydrasleeves were deployed in preparation for the next OMP monitoring event using the same string for consistency between events (same depth of sampling i.e. within screen).
Peristaltic pump (multi-level well sample collection)	The shallowest (non-dry) wells were sampled at each multi-level well location using Teflon-free dedicated and disposable high-density polyethylene (HDPE) tubing coupled to a peristaltic pump system. The groundwater was purged at a low flow rate of 0.2 mL/min. SWL and field parameters were measured during purging and post sample collection to ensure limited drawdown effects. The groundwater was sampled when the field parameters had stabilised.
Decontamination procedure	Dedicated HydraSleeves/tubing were used at each groundwater bore thus removing the need for decontamination. All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample was labelled with the sample location, date, project identification number and sampler's initials. Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation. Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	Groundwater samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance)., dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-

Activity	Details
	accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix D.
Laboratory Testing – Quality Control	Groundwater QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory. ▪ Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)]. ▪ Field blank samples at 1 per day.

3.2 Seepage Water Sampling Methodology

Seepage water monitoring procedure is detailed in Table 3-2.

Table 3-2 Seepage water Sampling method

Activity	Details
Field parameters	The following field parameters were recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.
Sampling Method	Sampling was carried out in a two-hour period; one hour each side of the low tide. Sampling protocol involved a shallow excavation in the beach sand; just above where inundation by wave action is occurring. Sampling containers were be lowered into the exposed seepage water and filled.
Decontamination procedure	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample was labelled with the sample location, date, project identification number and sampler's initials. Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation. Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	Seepage water samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance), DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	Seepage water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.3 Surface Water Sampling Methodology

Surface water monitoring procedure is detailed in Table 3-3.

Table 3-3 Surface water Sampling Method

Activity	Details
Field parameters	The following field parameters were recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.
Sampling Method	Surface water samples were collected directly into sample containers using a 'Grab' (manual) sample method via a long handled sampling device. Where depth permits, the sample container was positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films.
Decontamination procedure	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample was labelled with the sample location, date, project identification number and sampler's initials. Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation. Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	Surface water samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance), DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	Surface water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.4 Sediment Sampling Methodology

Sediment sampling methodology is detailed in Table 3-4.

Table 3-4 Sediment Sampling Method

Activity	Details
Sample Collection	Sediment samples were collected at the sediment/water interface using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under CoC documentation. At each sampling location, the sediment sample was visually assessed and observations (including physical description) recorded on field data sheets.
Field Records	The following information was recorded on the field data sheets: ▪ Sampling time, date and name of the sampler. ▪ Weather conditions. ▪ Sample Collection method. ▪ Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.
Decontamination	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Laboratory Testing	Sediment samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Total Organic Carbon (TOC), Electrical Conductivity (EC), Cation Exchange Capacity (CEC) and pH
Laboratory Testing – Quality Control	Sediment QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020): ▪ Field duplicate (intra-laboratory) samples at 1 per 20 sediment samples or 1 per batch if the batch is less than 20 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 20 sediment samples and sent to a secondary laboratory.

3.5 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

> QA documentation.

> Bias.

> Data Representativeness.

> Data Precision & Accuracy.

> Laboratory Performance.

> Data Comparability.

> Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E.

The QA/QC review concluded that there are no significant systematic errors in the data collection process and therefore, the dataset used for the assessment is considered valid and complete.

3.6 Assessment Criteria

3.6.1 Groundwater, Seepage water and surface water

The adopted assessment criteria for groundwater are detailed in Table 3-5.

Table 3-5 Criteria for Groundwater, Seepage water and surface water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS	PFOA	
	µg/L		
Human Health – Recreational Water	2[1]	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023[2]	19	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020).

3.6.2 Sediment

The adopted assessment criteria for sediment are detailed in Table 3-6.

Table 3-6 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS	PFOA	
	mg/kg		
Human Health - Commercial / industrial (on-base activities)	20[1]	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1[2]	10	HEPA 2020
Ecological - indirect exposure (interim guidelines)	0.01[2]	-	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only

4 Field Observations and Results

4.1 General Observations

No weather event or Site activities that could have impacted the sampling or results were observed.

4.2 Groundwater

4.2.1 Summary of Field Observations

4.2.1.1 Physicochemical parameters

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling record sheets, included in Appendix D. Field parameters were generally consistent with the previous monitoring event.

4.2.1.2 Groundwater Elevation and Migration

Well gauging was undertaken over several days and tide cycles which has been considered when interpreting inferred groundwater contours and flow direction.

Groundwater flow direction was interpreted to be radial from the site, with mounding occurring in the sand dunes, which is consistent with the previous monitoring events.

Groundwater elevation contours and flow direction are shown in Figure 3, Appendix A. Gauging records are presented in Appendix D.

4.2.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figure 4 in Appendix A presents the groundwater monitoring locations where a first time detection of Sum of PFOS and PFHxS or PFOA, or a new exceedance of guideline value were reported. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	0.80 (MW017)	30	0
PFOS	MW003, MW008, MW017, MW027, MW102, MW103, MW105, MW107, MW119, MW214.	0.01[3]	15.4 (MW017)	30	10
Sum of PFHxS and PFOS	MW003, MW017, MW119	2[2]	17 (MW017)	30	3

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

> There was no first-time detection of PFOS, PFOA or Sum of PFOS and PFHxS at any of the groundwater monitoring locations.

4.3 Seepage Water

4.3.1 Summary of Field Observations

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the seepage water sampling program are presented in field sampling records, included in Appendix D. Field parameters were generally consistent with the previous monitoring event.

4.3.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Laboratory results have also been compared to available historical data, Figure 4 in Appendix A presents the seepage water monitoring locations. The laboratory reports are provided in Appendix C.

Findings are summarised as follows:

> There was no first-time detection of PFOA or Sum of PFOS and PFHxS at the seepage water monitoring locations during the 2020 post-winter monitoring event.

> All 12 samples analysed reported PFAS concentrations below the laboratory LOR.

4.4 Surface water

4.4.1 Summary of Field Observations

Surface water sampling was somewhat limited due to most of the monitoring locations found dry during the monitoring event.

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the surface water sampling program are presented in field sampling records, included in Appendix D.

4.4.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Laboratory results have also been compared to available historical data, Figure 4 in Appendix A presents the surface water monitoring locations. The laboratory reports are provided in Appendix C.

Findings are summarised as follows:

- There was no first time detection of PFOA or Sum of PFOS and PFHxS, or new exceedance of guideline value at SW112.
- SW112 reported all PFAS concentrations below the laboratory LOR.

4.5 Sediment

4.5.1 Summary of Field Observations

Observations recorded during the sediment sampling program are provided in the field sampling record sheets within Appendix D.

4.5.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Soil criteria are adopted in the absence of criteria for sediment for consistency with the SAQP (Cardno, June 2020), DSI (GHD, 2018) and ERA (GHD, 2019). A summary of results exceeding the adopted criteria is presented in Table 4-2. Laboratory results have also been compared to available historical data. Figure 5 in Appendix A presents the sediment monitoring locations

Table 4-2 Summary of Surface water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (mg/kg)	Max Conc. (mg/kg)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	0.0009 (SD113)	6	0
PFOS	-	0.01[3]	0.0073 (SD113)	6	0
Sum of PFHxS and PFOS	-	20[4]	0.0085 (SD113)	6	0

Notes:

1. Non-inclusive of quality control samples
2. Ecosystems – all land uses – Direct exposure (HEPA, 2020)
3. Ecosystems – all land uses – Indirect exposure (HEPA, 2020)
4. Human health – Commercial/Industrial (HEPA, 2020)

Findings are summarised as follows:

- There was no first-time detection of PFOA or Sum of PFOS and PFHxS at the sediment monitoring locations during the 2020 post-winter monitoring event.
- No new exceedance of a guideline value was reported for any of the sediment monitoring locations during the 2020 post-winter monitoring event.
- All six sediment samples collected reported PFAS concentrations either below LOR or below the adopted assessment criteria.

4.6 Changes to the Monitoring Network Condition

Groundwater monitoring well MW116 was found to be locked with a padlock. No other changes to the monitoring network condition were observed.

5 Summary and Conclusions

Cardno undertook the 2020 post-winter groundwater, seepage water, surface water and sediment monitoring event at HEH-A as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 30 monitoring bores, one surface water location, 12 seepage water sampling locations and six sediment monitoring locations. One groundwater monitoring bore (MW219) and five surface water monitoring locations could not be sampled as these were found dry and one groundwater monitoring bore (MW116) was found locked.

Groundwater levels were gauged in all wells before sampling. Groundwater flow direction was interpreted to be radial from the site, with mounding occurring beneath the sand dunes, which is consistent with the previous monitoring event.

The groundwater laboratory results reported the following:

> Of the 30 samples that were tested, PFOS (10 samples) and Sum of PFHxS and PFOS (3 samples) reported concentrations that exceeded adopted assessment criteria.

> There was no first-time detection of PFOA, PFOS or Sum of PFOS and PFHxS at any of the groundwater monitoring locations.

The seepage water laboratory results reported the following:

> All 12 seepage water samples analysed reported PFAS concentrations below the laboratory LOR.

The surface water laboratory results reported the following:

> SW112 reported PFAS concentrations below the laboratory LOR.

The sediment laboratory results reported the following:

> All six sediment samples collected reported PFAS concentrations either below LOR or below the adopted assessment criteria.

> There was no first time detection of PFOA or Sum of PFOS and PFHxS at the sediment monitoring locations.

The next OMP sampling event for HEH-A will be the 2021 first flush monitoring event.

6 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. *Contaminated Sites Act 2003*, Western Australia.
5. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
6. Department of Environment Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*.
7. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (https://maps.water.wa.gov.au/#/webmap/gwm).
8. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, '*Guidance on Environmental Data Verification and Data Validation'.*
9. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
10. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
11. National Health and Medical Research Council (NHMRC) (2011, as updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
12. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
13. Standards Australia/Standards New Zealand (1998) AS5667.1:1998 *'Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'*.
14. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
15. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

Site Specific References

16. Cardno, June 2020, Reference: DEF19009, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt A'*.
17. Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter, HEH-A
18. Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report, HEH-A
19. Department of Defence, March 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Management Area Plan'.
20. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Ongoing Monitoring Plan'
21. GHD Pty Ltd, December 2018, Reference: 3135526,'Naval Communication Station Harold E Holt – Area A PFAS Investigations Detailed Site Investigation Report'.
22. GHD Pty Ltd, April 2019, Reference: 3135526, 'Harold E Holt A Ecological Risk Assessment'.

APPENDIX A

FIGURES

Harold E Holt Area A

North West Cape

Exmouth

Legend

Management Area / Commonwealth boundary

HEHA Site Features

FIGURE 1

1:100,000 Scale at A3

Meters

0 1,500 3,000

Site Location

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-001_RegionalLocation 03.mxd
Aerial Imagery Supplied by Google Earth

FIGURE 2

1:25,000 Scale at A3

Meters

0 500 1,000

Management Area

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-002_ManagementAreas 02.mxd


MW129 (0.2196)
MW130 (0.173)
MW134 (0.0976)
MW109 (0.2863)
MW110 (0.4087)
MW202 (0.729)
MW111 (0.3329)
MW119 (0.0569)
MW003 (0.243)
MW105 (0.1282)
MW212 (0.273)
MW008 (0.236)
MW112 (0.4036)
MW102 (0.2024)
MW019 (-0.025)
MW113 (0.39)
MW214 (0.105)
MW114 (0.2956)
MW017 (0.189)
MW104 (-0.0497)
MW217 (0.128)
MW115 (0.2315)
MW218 (0.14)
MW123 (-0.2344)
MW117 (0.0854)
0.1
0.2
0.3
0.4
0.6
0
-0.1
-0.2
Note: Well gauging data was collected over several days and tide cycles.
This has been considered when interpreting the inferred groundwater contours & direction.
Legend
Management Area
Groundwater monitoring wells (Nov20 RWL, mAHD)
Inferred groundwater contours (mAHD)
FIGURE 3
1:25,000 Scale at A3
Meters
0
500
1,000
Inferred Groundwater Contours
BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE
Cardno
Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-003_Nov-20_GWContours 01.mxd

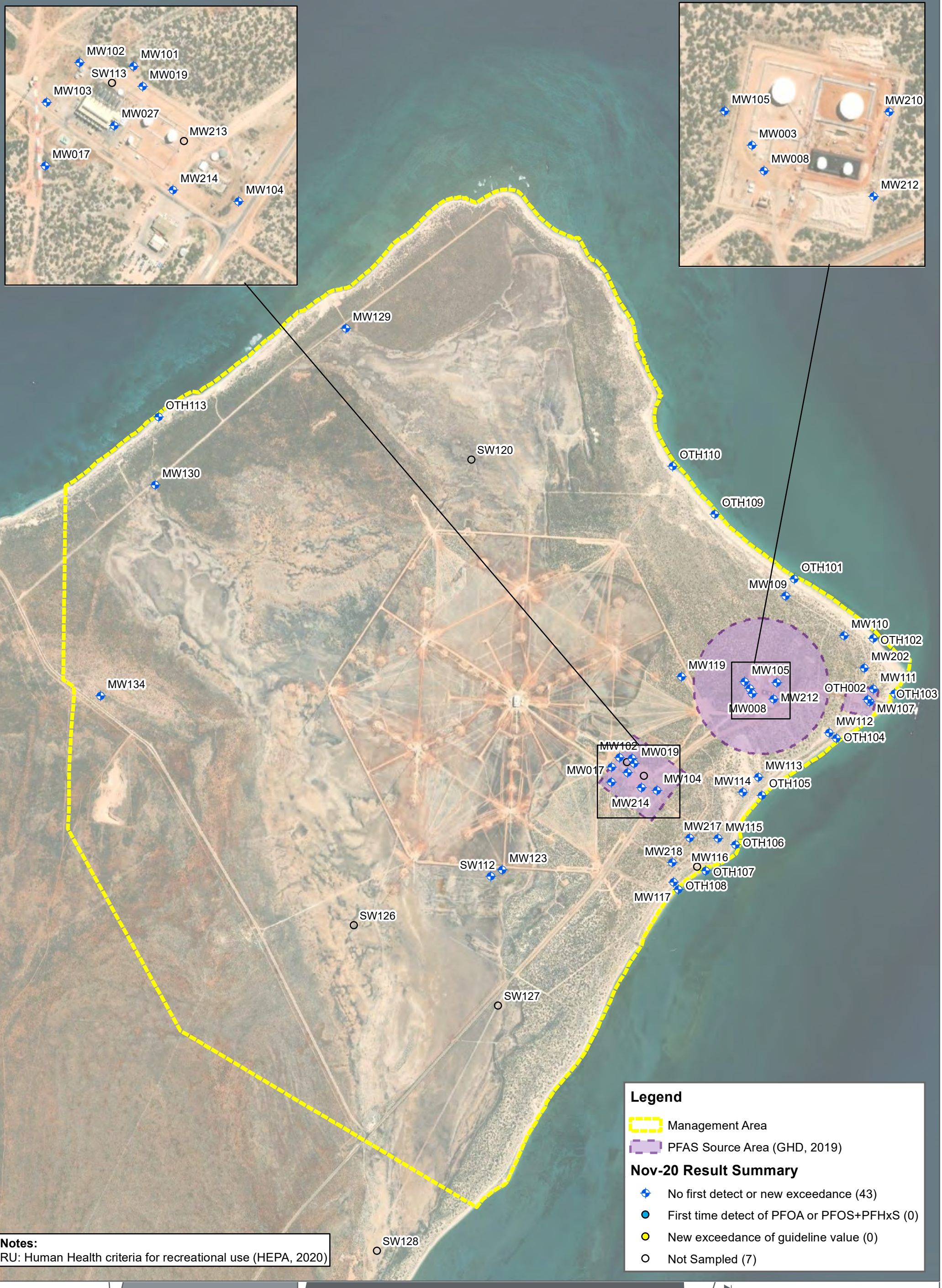
MW102
MW101
SW113
MW019
MW103
MW027
MW213
MW017
MW214
MW104
MW105
MW210
MW003
MW008
MW212
MW129
OTH113
SW120
OTH110
MW130
OTH109
OTH101
MW109
MW110
OTH102
MW202
MW119
MW111
OTH002
OTH103
MW107
MW112
OTH104
MW134
MW113
MW114
OTH105
MW217
MW115
OTH106
MW218
MW116
OTH107
OTH108
MW117
SW112
MW123
SW126
SW127
SW128
Legend
Management Area
PFAS Source Area (GHD, 2019)
Nov-20 Result Summary
No first detect or new exceedance (43)
First time detect of PFOA or PFOS+PFHxS (0)
New exceedance of guideline value (0)
Not Sampled (7)
Notes:
RU: Human Health criteria for recreational use (HEPA, 2020)
FIGURE 4
1:25,000 Scale at A3
Meters
0
500
1,000
Monitoring Locations & Results
BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE
Cardno
Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-004_Nov20_W_Results 01.mxd

FIGURE 5

1:25,000 Scale at A3

Meters

0 500 1,000

Sediment Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-005_Nov20_S_Results 01.mxd

APPENDIX

B

DATA ASSESSMENT TABLES

					Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids											(n:2
					Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR					0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05
PFAS NEMP (HEPA, 2020) - Ecological - 99% Species Protection Level									*LOR**						*19*							
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water															10							
Area	Lab Report Number	Field ID	Location Code	Date																		
Fuel Farm	EP2012749	0083_MW003_201117	MW003	17/11/2020	<0.02	0.03	0.77	0.04	*15.3*	<0.02	<0.1	0.61	0.51	0.22	0.18	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05
Fuel Farm	EP2012749	0083_MW008_201117	MW008	17/11/2020	<0.02	<0.02	<0.02	<0.02	*0.4*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012802	0083_MW017_201118	MW017	18/11/2020	0.05	0.06	1.59	0.18	*15.4*	<0.02	1.0	3.35	3.89	1.34	0.80	<0.02	<0.02	0.08	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012802	0083_MW019_201118	MW019	18/11/2020	<0.02	<0.02	0.03	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012802	0083_MW027_201118	MW027	18/11/2020	<0.02	<0.02	0.24	<0.02	*0.09*	<0.02	<0.1	0.08	0.04	0.04	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012802	0083_MW101_201118	MW101	18/11/2020	<0.02	<0.02	0.25	<0.02	<0.01	<0.02	<0.1	0.22	<0.02	0.10	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012802	0083_MW102_201118	MW102	18/11/2020	<0.02	0.03	0.39	<0.02	*0.06*	<0.02	<0.1	0.45	0.32	0.27	0.06	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012802	0083_MW103_201118	MW103	18/11/2020	0.10	0.07	0.45	<0.02	*0.06*	<0.02	0.3	0.84	0.94	0.18	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012904	0083_MW104_201118	MW104	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm	EP2012749	0083_MW105_201117	MW105	17/11/2020	<0.02	<0.02	0.09	<0.02	*0.22*	<0.02	<0.1	0.17	0.12	0.06	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012742	0083_MW107_201117	MW107	17/11/2020	<0.02	<0.02	<0.02	<0.02	*0.05*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012854	0083_MW109_201118	MW109	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012854	0083_MW110_201118	MW110	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012854	0083_MW111_201118	MW111	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012904	0083_MW112_201118	MW112	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012854	0083_MW113_201118	MW113	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012854	0083_MW114_201118	MW114	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012854	0083_MW115_201118	MW115	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012742	0083_MW117_201117	MW117	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm	EP2012749	0083_MW119_201117	MW119	17/11/2020	0.95	1.82	8.02	0.09	*0.1*	<0.02	0.4	3.96	1.21	0.24	0.14	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012904	0083_MW123_201118	MW123	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Boundary Well	EP2012743	0083_MW129_201117	MW129	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Boundary Well	EP2012743	0083_MW130_201117	MW130	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Boundary Well	EP2012743	0083_MW134_201117	MW134	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012854	0083_MW202_201118	MW202	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm	EP2012749	0083_MW210_201117	MW210	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm	EP2012749	0083_MW212_201117	MW212	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse	EP2012904	0083_MW213_201118	MW214	18/11/2020	<0.02	<0.02	<0.02	<0.02	*0.03*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012854	0083_MW217_201118	MW217	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012743	0083_MW218_201117	MW218	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Murat Pier Discharge	EP2012742	0083_OTH002_201117	OTH002	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012854	0083_OTH101_201118	OTH101	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Broader Area	EP2012854	0083_OTH102_201118	OTH102	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012742	0083_OTH103_201117	OTH103	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Fuel Farm pathway	EP2012904	0083_OTH104_201118	OTH104	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012742	0083_OTH105_201117	OTH105	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012742	0083_OTH106_201117	OTH106	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012742	0083_OTH107_201117	OTH107	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Powerhouse pathway	EP2012742	0083_OTH108_201117	OTH108	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Broader Area	EP2012854	0083_OTH109_201118	OTH109	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Broader Area	EP2012904	0083_OTH110_201118	OTH110	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Broader Area	EP2012743	0083_OTH113_201117	OTH113	17/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
Broader Area	EP2012855	0083_SW112_201118	SW112	18/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05

Note:
LOR - Limit of reporting
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L based on typical current laboratory limit of reporting (HEPA, 2020)

				) Fluorotelomer Sulfonic Acids			Perfluoroalkyl Sulfonamides							PFAS		
				6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)_	Sum of PFHxS and PFOS	Sum of PFAS
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR				0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
PFAS NEMP (HEPA, 2020) - Ecological - 99% Species Protection Level																
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water															2	
Area	Lab Report Number	Field ID	Location Code	Date												
Fuel Farm	EP2012749	0083_MW003_201117	MW003	17/11/2020	0.42	0.17	<0.05	0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	18.2	16.1	18.3
Fuel Farm	EP2012749	0083_MW008_201117	MW008	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.40	0.40	0.40
Powerhouse	EP2012802	0083_MW017_201118	MW017	18/11/2020	3.38	0.30	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	31.1	17.0	31.4
Powerhouse	EP2012802	0083_MW019_201118	MW019	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.03	0.03	0.03
Powerhouse	EP2012802	0083_MW027_201118	MW027	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.50	0.33	0.50
Powerhouse	EP2012802	0083_MW101_201118	MW101	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.59	0.25	0.59
Powerhouse	EP2012802	0083_MW102_201118	MW102	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.55	0.45	1.58
Powerhouse	EP2012802	0083_MW103_201118	MW103	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	2.89	0.51	2.96
Powerhouse	EP2012904	0083_MW104_201118	MW104	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm	EP2012749	0083_MW105_201117	MW105	17/11/2020	0.58	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.27	0.31	1.27
Fuel Farm pathway	EP2012742	0083_MW107_201117	MW107	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.05	0.05	0.05
Fuel Farm pathway	EP2012854	0083_MW109_201118	MW109	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm pathway	EP2012854	0083_MW110_201118	MW110	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm pathway	EP2012854	0083_MW111_201118	MW111	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm pathway	EP2012904	0083_MW112_201118	MW112	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012854	0083_MW113_201118	MW113	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012854	0083_MW114_201118	MW114	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012854	0083_MW115_201118	MW115	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012742	0083_MW117_201117	MW117	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm	EP2012749	0083_MW119_201117	MW119	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	15.0	8.12	16.9
Powerhouse	EP2012904	0083_MW123_201118	MW123	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Boundary Well	EP2012743	0083_MW129_201117	MW129	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Boundary Well	EP2012743	0083_MW130_201117	MW130	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Boundary Well	EP2012743	0083_MW134_201117	MW134	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm pathway	EP2012854	0083_MW202_201118	MW202	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm	EP2012749	0083_MW210_201117	MW210	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm	EP2012749	0083_MW212_201117	MW212	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse	EP2012904	0083_MW213_201118	MW214	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.03	0.03	0.03
Powerhouse pathway	EP2012854	0083_MW217_201118	MW217	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012743	0083_MW218_201117	MW218	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Murat Pier Discharge	EP2012742	0083_OTH002_201117	OTH002	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm pathway	EP2012854	0083_OTH101_201118	OTH101	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Broader Area	EP2012854	0083_OTH102_201118	OTH102	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm pathway	EP2012742	0083_OTH103_201117	OTH103	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Fuel Farm pathway	EP2012904	0083_OTH104_201118	OTH104	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012742	0083_OTH105_201117	OTH105	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012742	0083_OTH106_201117	OTH106	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012742	0083_OTH107_201117	OTH107	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Powerhouse pathway	EP2012742	0083_OTH108_201117	OTH108	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Broader Area	EP2012854	0083_OTH109_201118	OTH109	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Broader Area	EP2012904	0083_OTH110_201118	OTH110	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Broader Area	EP2012743	0083_OTH113_201117	OTH113	17/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Broader Area	EP2012855	0083_SW112_201118	SW112	18/11/2020	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Note:
LOR - Limit of reporting
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L based on typical current laboratory limit of reporting (HEPA, 2020)

					Inorganics																		Organic
					Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Calcium (filtered)	Chloride	Ionic Balance	Magnesium (filtered)	pH (Lab)	Potassium (filtered)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	TOC	Total Suspended Solids	Dissolved Organic Carbon
					mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	mg/L	%	mg/L	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR					1	1	1	1	0.01	0.01	1	1	0.01	1	0.01	1	1	1	10	1	5	1
PFAS NEMP (HEPA, 2020) - Ecological - 99% Species Protection Level																						
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water																						
Area	Lab Report Number	Field ID	Location Code	Date																		
Fuel Farm	EP2012749	0083_MW003_201117	MW003	17/11/2020	<1	294	<1	294	200	181	233	6,360	4.84	415	7.81	167	3,020	701	11,100	-	204	12
Fuel Farm	EP2012749	0083_MW008_201117	MW008	17/11/2020	<1	226	<1	226	310	309	269	9,860	0.08	732	7.77	282	5,250	1,300	19,700	-	328	2
Powerhouse	EP2012802	0083_MW017_201118	MW017	18/11/2020	<1	368	<1	368	205	219	238	6,300	3.36	494	7.77	232	3,700	964	14,200	-	368	15
Powerhouse	EP2012802	0083_MW019_201118	MW019	18/11/2020	<1	330	<1	330	306	318	282	9,600	1.98	710	7.66	314	5,470	1,380	20,100	-	88	40
Powerhouse	EP2012802	0083_MW027_201118	MW027	18/11/2020	<1	355	<1	355	277	280	295	8,690	0.48	624	7.74	272	4,760	1,210	18,600	-	72	24
Powerhouse	EP2012802	0083_MW101_201118	MW101	18/11/2020	<1	686	<1	686	258	278	218	8,100	3.81	651	7.56	267	4,760	754	18,400	142	4,030	-
Powerhouse	EP2012802	0083_MW102_201118	MW102	18/11/2020	<1	285	<1	285	242	238	254	7,580	0.79	525	7.73	233	4,050	1,070	16,200	-	88	50
Powerhouse	EP2012802	0083_MW103_201118	MW103	18/11/2020	<1	307	<1	307	223	222	261	6,920	0.40	500	7.74	220	3,720	1,060	14,400	-	327	8
Powerhouse	EP2012904	0083_MW104_201118	MW104	18/11/2020	<1	245	<1	245	161	158	179	4,820	0.84	383	7.95	143	2,620	956	10,100	-	352	3
Fuel Farm	EP2012749	0083_MW105_201117	MW105	17/11/2020	<1	269	<1	269	338	325	287	10,800	1.92	771	7.72	305	5,500	1,320	20,300	-	10,200	2
Fuel Farm pathway	EP2012742	0083_MW107_201117	MW107	17/11/2020	<1	166	<1	166	611	652	498	19,500	3.21	1,450	7.68	621	11,300	2,770	38,400	-	2,020	21
Fuel Farm pathway	EP2012854	0083_MW109_201118	MW109	18/11/2020	<1	116	<1	116	600	642	450	19,200	3.34	1,440	7.64	536	11,200	2,710	42,700	-	141	6
Fuel Farm pathway	EP2012854	0083_MW110_201118	MW110	18/11/2020	<1	208	<1	208	584	621	475	18,600	3.12	1,390	7.47	518	10,800	2,630	40,600	-	444	43
Fuel Farm pathway	EP2012854	0083_MW111_201118	MW111	18/11/2020	<1	360	<1	360	524	548	443	16,700	2.22	1,180	7.68	594	9,500	2,190	36,500	-	187	8
Fuel Farm pathway	EP2012904	0083_MW112_201118	MW112	18/11/2020	<1	135	<1	135	596	649	461	19,000	4.23	1,460	7.79	545	11,300	2,750	39,200	-	306	2
Powerhouse pathway	EP2012854	0083_MW113_201118	MW113	18/11/2020	<1	140	<1	140	586	626	444	18,700	3.27	1,410	7.64	524	10,900	2,680	41,200	6	974	-
Powerhouse pathway	EP2012854	0083_MW114_201118	MW114	18/11/2020	<1	158	<1	158	581	656	482	18,400	6.08	1,480	7.62	553	11,400	2,810	43,100	10	18,200	-
Powerhouse pathway	EP2012854	0083_MW115_201118	MW115	18/11/2020	<1	171	<1	171	585	615	452	18,700	2.50	1,380	7.72	512	10,700	2,580	40,000	4	21,500	-
Powerhouse pathway	EP2012742	0083_MW117_201117	MW117	17/11/2020	<1	128	<1	128	600	713	510	19,100	8.63	1,590	7.72	682	12,400	2,810	38,900	-	23,300	<1
Fuel Farm	EP2012749	0083_MW119_201117	MW119	17/11/2020	<1	266	<1	266	260	242	203	8,370	3.49	551	7.84	252	4,150	890	15,200	-	102	6
Powerhouse	EP2012904	0083_MW123_201118	MW123	18/11/2020	<1	139	<1	139	683	739	544	21,800	3.93	1,640	7.58	614	12,900	3,140	45,100	-	524	2
Boundary Well	EP2012743	0083_MW129_201117	MW129	17/11/2020	<1	260	<1	260	599	562	468	19,400	3.17	1,270	7.53	513	9,690	2,250	35,300	14	39,700	-
Boundary Well	EP2012743	0083_MW130_201117	MW130	17/11/2020	<1	285	<1	285	593	583	440	19,000	0.87	1,360	7.64	553	10,000	2,480	33,000	6	14,500	-
Boundary Well	EP2012743	0083_MW134_201117	MW134	17/11/2020	<1	176	<1	176	485	483	428	15,600	0.16	1,000	7.70	469	8,450	1,980	27,000	5	25,800	-
Fuel Farm pathway	EP2012854	0083_MW202_201118	MW202	18/11/2020	<1	253	<1	253	503	519	373	16,100	1.54	1,160	7.67	548	8,990	2,120	33,700	-	50	<1
Fuel Farm	EP2012749	0083_MW210_201117	MW210	17/11/2020	<1	259	<1	259	268	270	263	8,540	0.34	642	7.78	254	4,550	1,080	16,800	-	68	3
Fuel Farm	EP2012749	0083_MW212_201117	MW212	17/11/2020	<1	214	<1	214	357	350	290	11,500	0.96	808	7.78	330	6,000	1,370	20,600	-	130	2
Powerhouse	EP2012904	0083_MW213_201118	MW214	18/11/2020	<1	176	<1	176	43.6	42.6	90	1,240	1.14	108	8.10	42	647	244	2,480	-	548	3
Powerhouse pathway	EP2012854	0083_MW217_201118	MW217	18/11/2020	<1	201	<1	201	370	416	342	12,000	5.80	918	7.84	417	7,190	1,340	27,400	-	16	3
Powerhouse pathway	EP2012743	0083_MW218_201117	MW218	17/11/2020	<1	190	<1	190	272	261	237	8,720	2.04	614	7.93	249	4,420	1,060	16,200	-	112	<1
Murat Pier Discharge	EP2012742	0083_OTH002_201117	OTH002	17/11/2020	<1	119	<1	119	617	687	496	19,700	5.36	1,550	8.01	663	11,900	2,830	38,100	4	91	-
Fuel Farm pathway	EP2012854	0083_OTH101_201118	OTH101	18/11/2020	<1	113	<1	113	600	660	467	19,200	4.80	1,490	8.07	546	11,500	2,680	41,200	-	54	1
Broader Area	EP2012854	0083_OTH102_201118	OTH102	18/11/2020	<1	125	<1	125	588	648	455	18,800	4.83	1,460	8.00	539	11,300	2,670	42,600	-	498	1
Fuel Farm pathway	EP2012742	0083_OTH103_201117	OTH103	17/11/2020	<1	118	<1	118	617	645	464	19,700	2.25	1,450	8.03	616	11,200	2,830	38,800	2	43	-
Fuel Farm pathway	EP2012904	0083_OTH104_201118	OTH104	18/11/2020	<1	121	<1	121	611	664	462	19,500	4.18	1,490	8.07	550	11,600	2,810	40,300	-	136	1
Powerhouse pathway	EP2012742	0083_OTH105_201117	OTH105	17/11/2020	<1	116	<1	116	619	686	496	19,800	5.12	1,540	8.05	649	11,900	2,790	38,900	-	255	2
Powerhouse pathway	EP2012742	0083_OTH106_201117	OTH106	17/11/2020	<1	116	<1	116	619	686	496	19,800	5.12	1,540	8.09	652	11,900	2,790	39,000	-	66	2
Powerhouse pathway	EP2012742	0083_OTH107_201117	OTH107	17/11/2020	<1	116	<1	116	616	680	495	19,700	5.00	1,530	8.05	652	11,800	2,770	35,800	-	166	2
Powerhouse pathway	EP2012742	0083_OTH108_201117	OTH108	17/11/2020	<1	154	<1	154	619	662	479	19,800	3.36	1,480	7.90	634	11,500	2,760	39,000	-	590	4
Broader Area	EP2012854	0083_OTH109_201118	OTH109	18/11/2020	<1	115	<1	115	597	643	452	19,100	3.67	1,450	8.09	536	11,200	2,700	41,500	-	80	1
Broader Area	EP2012904	0083_OTH110_201118	OTH110	18/11/2020	<1	118	<1	118	602	647	452	19,200	3.63	1,450	8.11	537	11,300	2,780	39,700	-	91	1
Broader Area	EP2012743	0083_OTH113_201117	OTH113	17/11/2020	<1	111	<1	111	623	657	457	20,000	2.62	1,480	8.20	631	11,400	2,720	37,400	-	33	1
Broader Area	EP2012855	0083_SW112_201118	SW112	18/11/2020	<1	201	<1	201	3,230	3,960	1,020	105,000	10.2	9,150	7.70	4,130	70,200	12,600	236,000	-	986	42

Note:
LOR - Limit of reporting
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L based on typical current laboratory limit of reporting (HEPA, 2020)

			Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids											(n:2) Fluorotelomer Sulfonic Acids			
			Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR - Limit of Reporting			0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005
PFAS NEMP (HEPA, 2020) Ecological – direct exposure (interim guidelines)							*1*						*10*										
PFAS NEMP (HEPA, 2020) Ecological – indirect exposure (interim guidelines) (on site)							0.01																
PFAS NEMP (HEPA, 2020) Commercial / industrial (on-base activities)													50										
Lab Report Number	Field ID	Location Code	Date																				
EP2012856	0083_SD112_0.00-0.10_201118	SD112	18/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012801	0083_SD113_201118	SD113	18/11/2020	0.0004	<0.0002	0.0012	<0.0002	0.0073	<0.0002	<0.001	0.0020	0.0032	0.0009	0.0009	<0.0002	<0.0002	0.0004	<0.0005	<0.0002	<0.0002	<0.0005	0.0200	0.0152	<0.0005
EP2012856	0083_SD120_0.00-0.10_201118	SD120	18/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012744	0083_SD126_201117	SD126	17/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012741	0083_SD127_201117	SD127	17/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012741	0083_SD128_201117	SD128	17/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005

Note:

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

			Perfluoroalkyl Sulfonamides							PFAS			Inorganics								Organic
			Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)_	Sum of PFHxS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity *(lab)	pH (Lab)	Organic Matter
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%
LOR - Limit of Reporting			0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5
PFAS NEMP (HEPA, 2020) Ecological – direct exposure (interim guidelines)																					
PFAS NEMP (HEPA, 2020) Ecological – indirect exposure (interim guidelines) (on site)																					
PFAS NEMP (HEPA, 2020) Commercial / industrial (on-base activities)										20											
Lab Report Number	Field ID	Location Code	Date																		
EP2012856	0083_SD112_0.00-0.10_201118	SD112	18/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.3	18.4	2.0	<0.1	0.3	20.7	12,200	8.3	1.3
EP2012801	0083_SD113_201118	SD113	18/11/2020	0.0003	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0511	0.0085	0.0518	0.7	22.7	2.2	0.1	0.2	25.1	391	7.6	9.7
EP2012856	0083_SD120_0.00-0.10_201118	SD120	18/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.7	38.1	7.4	0.3	0.8	46.6	20,200	8.8	1.7
EP2012744	0083_SD126_201117	SD126	17/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.7	61.2	3.6	0.1	0.5	65.5	12,400	9.4	2.0
EP2012741	0083_SD127_201117	SD127	17/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.7	34.3	1.3	<0.1	0.2	35.9	9,500	9.0	1.2
EP2012741	0083_SD128_201117	SD128	17/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.4	54.7	6.1	0.1	0.9	61.8	26,400	9.3	1.8

Note:

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

				Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids										
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting				0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02
Lab Report Number	Field ID	Date	Sample Type																	
EP2012742	0083_QC301_201117	17/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012802	0083_QC301_201118	18/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012742	0083_QC302_201117	17/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012802	0083_QC302_201118	18/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012742	0083_QC303_201117	17/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012802	0083_QC303_201118	18/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012742	0083_QC401_201117	17/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012802	0083_QC401_201118	18/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012742	0083_QC402_201117	17/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012802	0083_QC402_201118	18/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012742	0083_QC403_201117	17/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
EP2012802	0083_QC403_201118	18/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02

				(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides							PFAS		
				4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)_	Sum of PFHxS and PFOS	Sum of PFAS
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting				0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
Lab Report Number	Field ID	Date	Sample Type														
EP2012742	0083_QC301_201117	17/11/2020	Rinsate	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012802	0083_QC301_201118	18/11/2020	Rinsate	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012742	0083_QC302_201117	17/11/2020	Rinsate	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012802	0083_QC302_201118	18/11/2020	Rinsate	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012742	0083_QC303_201117	17/11/2020	Rinsate	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012802	0083_QC303_201118	18/11/2020	Rinsate	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012742	0083_QC401_201117	17/11/2020	Field_B	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012802	0083_QC401_201118	18/11/2020	Field_B	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012742	0083_QC402_201117	17/11/2020	Field_B	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012802	0083_QC402_201118	18/11/2020	Field_B	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012742	0083_QC403_201117	17/11/2020	Field_B	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2012802	0083_QC403_201118	18/11/2020	Field_B	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Lab Report Number			EP2012743	EP2012743		EP2012743	758001		EP2012743	EP2012743		
Field ID			0083_MW129_201117	0083_QC102_201117		0083_MW129_201117	0083_QC202_201117		0083_MW130_201117	0083_QC103_201117		
Date			17/11/2020	17/11/2020		17/11/2020	17/11/2020		17/11/2020	17/11/2020		
Matrix Type			Water	Water	RPD	Water	Water	RPD	Water	Water	RPD	
	Unit	LOR										
Perfluoroalkane Sulfonic Acids												
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	0.01	0	<0.01	<0.01	0	
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluoroalkane Carboxylic Acids												
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	
(n:2) Fluorotelomer Sulfonic Acids												
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	
Perfluoroalkyl Sulfonamides												
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	
PFAS												
Sum of PFAS (WA DER List)_	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.05	0	<0.01	<0.01	0	
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	0.01	0	<0.01	<0.01	0	
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.1	0	<0.01	<0.01	0	
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	-	-	-	0.01	-	-	-	-	
Inorganics												
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	-	-	<1	<1	0	
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	260	263	1	260	-	-	285	288	1	
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	-	-	<1	<1	0	
Alkalinity (total) as CaCO3	mg/L	1	260	263	1	260	-	-	285	288	1	
Anions Total	meq/L	0.01	599	608	1	599	-	-	593	590	1	
Cations Total	meq/L	0.01	562	586	4	562	-	-	583	571	2	
Calcium	mg/L	0.5	-	-	-	-	410	-	-	-	-	
Calcium (filtered)	mg/L	1	468	484	3	468	-	-	440	431	2	
Chloride	mg/L	1	19,400	19,600	1	19,400	36,000	60	19,000	19,000	0	
Ionic Balance	%	0.01	3.17	1.89	51	3.17	-	-	0.87	1.56	57	
Magnesium	mg/L	0.5	-	-	-	-	1,100	-	-	-	-	
Magnesium (filtered)	mg/L	1	1,270	1,320	4	1,270	-	-	1,360	1,330	2	
pH (Lab)	pH Units	0.01	7.53	7.54	0	7.53	7.8	4	7.64	7.65	0	
Potassium	mg/L	0.5	-	-	-	-	310	-	-	-	-	
Potassium (filtered)	mg/L	1	513	535	4	513	-	-	553	538	3	
Sodium	mg/L	0.5	-	-	-	-	9,300	-	-	-	-	
Sodium (filtered)	mg/L	1	9,690	10,100	4	9,690	-	-	10,000	9,810	2	
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	2,250	2,410	7	2,250	-	-	2,480	2,300	8	
Sulphate	mg/L	5	-	-	-	-	2,600	-	-	-	-	
TDS	mg/L	10	35,300	33,800	4	35,300	29,000	20	33,000	33,700	2	
TOC	mg/L	1	14	21	40	14	-	-	6	2	100	
Total Suspended Solids	mg/L	1	39,700	28,700	32	39,700	5,400	152	14,500	10,600	31	
Organic												
Dissolved Organic Carbon	mg/L	1	-	-	-	-	-	-	-	-	-	
Dissolved Organic Carbon (filtered)	mg/L	5	-	-	-	-	5.2	-	-	-	-	

*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Lab Report Number			EP2012743	758001		EP2012749	EP2012749		EP2012749	758001		EP2012743	EP2012743		EP2012743
Field ID			0083_MW130_201117	0083_QC203_201117		0083_MW212_201117	0083_QC104_201117		0083_MW212_201117	0083_QC204_201117		0083_MW134_201117	0083_QC105_201117		0083_MW134_201117
Date			17/11/2020	17/11/2020		17/11/2020	17/11/2020		17/11/2020	17/11/2020		17/11/2020	17/11/2020		17/11/2020
Matrix Type			Water	Water	RPD	Water	Water	RPD	Water	Water	RPD	Water	Water	RPD	Water
	Unit	LOR													
Perfluoroalkane Sulfonic Acids															
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluoroalkane Carboxylic Acids															
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02
(n:2) Fluorotelomer Sulfonic Acids															
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05
Perfluoroalkyl Sulfonamides															
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05
PFAS															
Sum of PFAS (WA DER List)_	µg/L	0.01	<0.01	<0.05	0	<0.01	<0.01	0	<0.01	<0.05	0	<0.01	<0.01	0	<0.01
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01
Sum of PFAS	µg/L	0.01	<0.01	<0.1	0	<0.01	<0.01	0	<0.01	<0.1	0	<0.01	<0.01	0	<0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-
Inorganics															
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	93	196	<1	<1	0	<1	<10	0	<1	<1	0	<1
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	285	5,600	181	214	212	1	214	230	7	176	209	17	176
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<20	0	<1	<1	0	<1	<20	0	<1	<1	0	<1
Alkalinity (total) as CaCO3	mg/L	1	285	5,700	181	214	212	1	214	230	7	176	209	17	176
Anions Total	meq/L	0.01	593	-	-	357	365	2	357	-	-	485	456	6	485
Cations Total	meq/L	0.01	583	-	-	350	328	6	350	-	-	483	486	1	483
Calcium	mg/L	0.5	-	350	-	-	-	-	-	290	-	-	-	-	-
Calcium (filtered)	mg/L	1	440	-	-	290	269	8	290	-	-	428	432	1	428
Chloride	mg/L	1	19,000	26,000	31	11,500	11,800	3	11,500	15,000	26	15,600	14,600	7	15,600
Ionic Balance	%	0.01	0.87	-	-	0.96	5.40	140	0.96	-	-	0.16	3.16	181	0.16
Magnesium	mg/L	0.5	-	1,100	-	-	-	-	-	780	-	-	-	-	-
Magnesium (filtered)	mg/L	1	1,360	-	-	808	758	6	808	-	-	1,000	1,010	1	1,000
pH (Lab)	pH Units	0.01	7.64	7.9	3	7.78	7.79	0	7.78	8.0	3	7.70	7.68	0	7.70
Potassium	mg/L	0.5	-	330	-	-	-	-	-	240	-	-	-	-	-
Potassium (filtered)	mg/L	1	553	-	-	330	310	6	330	-	-	469	471	0	469
Sodium	mg/L	0.5	-	9,100	-	-	-	-	-	5,300	-	-	-	-	-
Sodium (filtered)	mg/L	1	10,000	-	-	6,000	5,610	7	6,000	-	-	8,450	8,490	0	8,450
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	2,480	-	-	1,370	1,350	1	1,370	-	-	1,980	1,930	3	1,980
Sulphate	mg/L	5	-	2,900	-	-	-	-	-	1,600	-	-	-	-	-
TDS	mg/L	10	33,000	28,000	16	20,600	20,100	2	20,600	20,000	3	27,000	27,100	0	27,000
TOC	mg/L	1	6	-	-	-	-	-	-	-	-	5	16	105	5
Total Suspended Solids	mg/L	1	14,500	6,400	78	130	86	41	130	260	67	25,800	23,900	8	25,800
Organic															
Dissolved Organic Carbon	mg/L	1	-	-	-	2	<1	67	2	-	-	-	-	-	-
Dissolved Organic Carbon (filtered)	mg/L	5	-	47	-	-	-	-	-	<5	-	-	-	-	-

*RPDs have only been considered where a concentration is greater than 1 times the
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for
***Interlab Duplicates are matched on a per compound basis as methods vary betw

Lab Report Number			758001		EP2012749	EP2012749		EP2012749	758001		EP2012855	EP2012855		EP2012855	760299	
Field ID			0083_QC205_201117		0083_MW105_201117	0083_QC106_201117		0083_MW105_201117	0083_QC206_201117		0083_SW112_201118	0083_QC107_201118		0083_SW112_201118	0083_QC207_201117	
Date			17/11/2020		17/11/2020	17/11/2020		17/11/2020	17/11/2020		18/11/2020	18/11/2020		18/11/2020	17/11/2020	
Matrix Type			Water	RPD	Water	Water	RPD	Water	Water	RPD	Water	Water	RPD	Water	Water	RPD
	Unit	LOR														
Perfluoroalkane Sulfonic Acids																
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.01	0	<0.02	0.02	0	<0.02	0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.01	0	0.09	0.12	29	0.09	0.20	76	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	0	0.22	0.20	10	0.22	0.24	9	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroalkane Carboxylic Acids																
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.05	0	<0.1	<0.1	0	<0.1	0.11	10	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.01	0	0.17	0.26	42	0.17	0.23	30	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.01	0	0.12	0.20	50	0.12	0.23	63	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.01	0	0.06	0.11	59	0.06	0.12	67	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	0	0.03	0.04	29	0.03	0.05	50	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
(n:2) Fluorotelomer Sulfonic Acids																
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	0	0.58	0.55	5	0.58	0.60	3	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroalkyl Sulfonamides																
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS																
Sum of PFAS (WA DER List)_	µg/L	0.01	<0.05	0	1.27	1.50	17	1.27	1.8	35	<0.01	<0.01	0	<0.01	<0.05	0
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	0	0.31	0.32	3	0.31	0.44	35	<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS	µg/L	0.01	<0.1	0	1.27	1.50	17	1.27	1.81	35	<0.01	<0.01	0	<0.01	<0.1	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	<0.01	-	-	-	-	-	0.49	-	-	-	-	-	<0.01	-
Inorganics																
Carbonate Alkalinity (as CaCO3)	mg/L	1	2,800	200	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	58,000	199	269	315	16	269	710	90	201	200	0	201	220	9
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<20	0	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1	61,000	199	269	315	16	269	710	90	201	200	0	201	220	9
Anions Total	meq/L	0.01	-	-	338	342	1	338	-	-	3,230	3,290	2	3,230	-	-
Cations Total	meq/L	0.01	-	-	325	334	3	325	-	-	3,960	4,100	3	3,960	-	-
Calcium	mg/L	0.5	470	-	-	-	-	-	320	-	-	-	-	-	1,300	-
Calcium (filtered)	mg/L	1	-	-	287	292	2	287	-	-	1,020	1,060	4	1,020	-	-
Chloride	mg/L	1	17,000	9	10,800	10,900	1	10,800	12,000	11	105,000	107,000	2	105,000	97,000	8
Ionic Balance	%	0.01	-	-	1.92	1.13	52	1.92	-	-	10.2	11.0	8	10.2	-	-
Magnesium	mg/L	0.5	1,000	-	-	-	-	-	750	-	-	-	-	-	9,500	-
Magnesium (filtered)	mg/L	1	-	-	771	773	0	771	-	-	9,150	9,420	3	9,150	-	-
pH (Lab)	pH Units	0.01	7.9	3	7.72	7.80	1	7.72	8.0	4	7.70	7.77	1	7.70	7.7	0
Potassium	mg/L	0.5	350	-	-	-	-	-	230	-	-	-	-	-	2,800	-
Potassium (filtered)	mg/L	1	-	-	305	317	4	305	-	-	4,130	4,270	3	4,130	-	-
Sodium	mg/L	0.5	7,200	-	-	-	-	-	4,800	-	-	-	-	-	65,000	-
Sodium (filtered)	mg/L	1	-	-	5,500	5,700	4	5,500	-	-	70,200	72,600	3	70,200	-	-
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	-	-	1,320	1,350	2	1,320	-	-	12,600	12,700	1	12,600	-	-
Sulphate	mg/L	5	2,500	-	-	-	-	-	1,600	-	-	-	-	-	9,500	-
TDS	mg/L	10	20,000	30	20,300	18,500	9	20,300	20,000	1	236,000	239,000	1	236,000	260,000	10
TOC	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	6,000	125	10,200	1,240	157	10,200	1,200	158	986	198	133	986	660	40
Organic																
Dissolved Organic Carbon	mg/L	1	-	-	2	7	111	2	-	-	42	36	15	42	-	-
Dissolved Organic Carbon (filtered)	mg/L	5	25	-	-	-	-	-	6.1	-	-	-	-	-	27	-

*RPDs have only been considered where a concentration is greater than 1 times the
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for
***Interlab Duplicates are matched on a per compound basis as methods vary betw

		Lab Report Number	EP2012741	EP2012741		EP2012741	758001	
		Field ID	0083_SD127_201117	0083_QC101_201117		0083_SD127_201117	0083_QC201_201117	
		Date	17/11/2020	17/11/2020		17/11/2020	17/11/2020	
		Matrix Type	Soil	Soil	RPD	Soil	Soil	RPD
	Unit	LOR						
Perfluoroalkane Sulfonic Acids								
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005	-	-	-	-	<0.005	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005	-	-	-	-	<0.005	-
Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroalkane Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
(n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS								
Sum of PFAS (WA DER List)_	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0
Sum of PFHxS and PFOS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Sum of PFAS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.05	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	0.005	-	-	-	-	<0.005	-
Inorganics								
Conductivity (1:5 aqueous extract)	µS/cm	10	-	-	-	-	2,300	-
Exchangeable Sodium Percent	%	0.1	0.7	0.7	0	0.7	-	-
pH (1:5 Aqueous extract at 25Â°C as rec.)	pH Units	0.1	-	-	-	-	8.8	-
Exchangeable Calcium	meq/100g	0.1	34.3	50.6	38	34.3	-	-
Exchangeable Magnesium	meq/100g	0.1	1.3	2.6	67	1.3	-	-
Exchangeable Potassium	meq/100g	0.1	<0.1	<0.1	0	<0.1	-	-
Exchangeable Sodium	meq/100g	0.1	0.2	0.4	67	0.2	-	-
CEC	meq/100g	0.05	35.9	53.6	40	35.9	81	77
Electrical conductivity *(lab)	µS/cm	1	9,500	5,870	47	9,500	-	-
pH (Lab)	pH Units	0.1	9.0	8.9	1	9.0	-	-
TOC	mg/kg	1,000	-	-	-	-	<1,000	-
Organic								
Organic Matter	%	0.5	1.2	1.2	0	1.2	-	-

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

APPENDIX

C

LABORATORY CERTIFICATES

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ **Sydney Laboratory** Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2066 02 9900 8400 EnviroSampleNSW@eurofins.com

☐ **Brisbane Laboratory** Unit 1 21 Smallwood Place Murarrie QLD 4172 07 3902 4600 EnviroSampleQLD@eurofins.com

☐ **Perth Laboratory** Unit 2 91 Leach Highway Kewdale WA 6105 08 9251 9600 EnviroSampleWA@eurofins.com

☐ **Melbourne Laboratory** 6 Monterey Road Dandenong South VIC 3175 03 8564 5000 EnviroSampleVic@eurofins.com

Company	CARDNO	**Project №**	WA_0082_PFASOMP	**Project Manager**	David James
Address	11 harvest Tce WEST PERTH	**Project Name**	HEH-A	**EDD Format** ESdat, EQuIS etc	ESdat
Contact Name	Maelle Bourdais			**Sampler(s)**	
Phone №	0448 308 372			**Handed over by**	ALS
Special Directions	Please send ESdat report to derp.labreports@esdat.com.au with the project No in the header file.			**Email for Invoice**	claire.armstrong@cardno.com.au
Purchase Order	DEF19009/530			**Email for Results**	maelle.bourdais@cardno.com.au derp.labreports@esdat.com.au
Quote ID №					

Analyses (Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing)

Containers (Change container type & size if necessary.)

Required Turnaround Time (TAT) (Default will be 5 days if not ticked. ♦Surcharge will apply)

☐ Overnight (reporting by 9am)♦ ☐ Same day♦ ☐ 1 day♦ ☐ 2 days♦ ☐ 3 days♦ ☒ 5 days (Standard) ☐ Other( )

№	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)	Full PFAS suite	(water) Major anions & cations	(water) DOC, TSS, TDS, pH	(sediment) TOC, CEC, pH	500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)	Sample Comments / Dangerous Goods Hazard Warning
1	0083_QC201_201117	17/11/20	S	X			X									
2	0083_QC202_201117		W	X	X	X										
3	0083_QC203_201117		W	X	X	X										
4	0083_QC204_201117		W	X	X	X										
5	0083_QC205_201117		W	X	X	X										
6	0083_QC206-201117		W	X	X	X										
7																
8																
9																
10																
	Total Counts															

Method of Shipment ☐ Courier (#) ☐ Hand Delivered ☐ Postal

Laboratory Use Only	Received By	Rob Johnston	SYD | BNE | MEL | PER | ADL | NTL | DRW	Name		Signature		Date		Time	
	Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	19/11/20	Time	10:37	Temperature	11.8°C
				Signature		Date		Time		Report №	758001

Eurofins Environment Testing Australia Pty Ltd

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request.

eurofins | Environment Testing

ABN: 50 005 085 521 www.eurofins.com.au EnviroSales@eurofins.com

Australia

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IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
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IANZ # 1290

Sample Receipt Advice

Company name:	Cardno (WA)
Contact name:	David James
Project name:	HEH-A
Project ID:	WA_0082_PFASOMP
Turnaround time:	5 Day
Date/Time received	Nov 19, 2020 10:37 AM
Eurofins reference	758001

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Robert Johnston on phone : or by email: EnviroWA@eurofins.com

Results will be delivered electronically via email to David James - David.James@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (WA) email address.

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/330
Report #: 758001
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 19, 2020 10:37 AM
Due: Nov 26, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail	Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271	X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794									X		
Perth Laboratory - NATA Site # 23736											
Mayfield Laboratory											
External Laboratory											

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID										
1	0083_QC201_201117	Nov 17, 2020		Soil	P20-No33907		X		X		X	X		X		
2	0083_QC202_201117	Nov 17, 2020		Water	P20-No33908	X		X		X			X	X	X	X
3	0083_QC203_201117	Nov 17, 2020		Water	P20-No33909	X		X		X			X	X	X	X
4	0083_QC204_201117	Nov 17, 2020		Water	P20-No33910	X		X		X			X	X	X	X
5	0083_QC205_201117	Nov 17, 2020		Water	P20-No33911	X		X		X			X	X	X	X
6	0083_QC206_	Nov 17, 2020		Water	P20-No33912	X		X		X			X	X	X	X

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/330
Report #: 758001
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 19, 2020 10:37 AM
Due: Nov 26, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail	Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271	X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794									X		
Perth Laboratory - NATA Site # 23736											
Mayfield Laboratory											
External Laboratory											
201117											
Test Counts	5	1	5	1	5	1	1	5	6	5	5

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005

NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **David James**

Report **758001-S**
Project name HEH-A
Project ID WA_0082_PFASOMP
Received Date Nov 19, 2020

Client Sample ID			**0083_QC201_201117**
Sample Matrix			**Soil**
Eurofins Sample No.			**P20-No33907**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	2300
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.8
Total Organic Carbon	0.1	%	< 0.1
% Moisture	1	%	23
Cation Exchange Capacity			
Cation Exchange Capacity	0.05	meq/100g	81
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	76
13C5-PFPeA (surr.)	1	%	74
13C5-PFHxA (surr.)	1	%	68
13C4-PFHpA (surr.)	1	%	76
13C8-PFOA (surr.)	1	%	91
13C5-PFNA (surr.)	1	%	97
13C6-PFDA (surr.)	1	%	85
13C2-PFUnDA (surr.)	1	%	130
13C2-PFDoDA (surr.)	1	%	122
13C2-PFTeDA (surr.)	1	%	83
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5

Client Sample ID			0083_QC201_201117
Sample Matrix			**Soil**
Eurofins Sample No.			**P20-No33907**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	99
D3-N-MeFOSA (surr.)	1	%	85
D5-N-EtFOSA (surr.)	1	%	81
D7-N-MeFOSE (surr.)	1	%	72
D9-N-EtFOSE (surr.)	1	%	75
D5-N-EtFOSAA (surr.)	1	%	100
D3-N-MeFOSAA (surr.)	1	%	106
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	94
18O2-PFHxS (surr.)	1	%	103
13C8-PFOS (surr.)	1	%	132
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5
13C2-4:2 FTSA (surr.)	1	%	INT
13C2-6:2 FTSA (surr.)	1	%	48
13C2-8:2 FTSA (surr.)	1	%	36
13C2-10:2 FTSA (surr.)	1	%	78
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Conductivity (1:5 aqueous extract at 25°C as rec.)	Melbourne	Nov 20, 2020	7 Days
- Method: LTM-INO-4030 Conductivity			
Cation Exchange Capacity	Melbourne	Nov 23, 2020	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage			
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Nov 20, 2020	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Total Organic Carbon	Melbourne	Nov 21, 2020	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
% Moisture	Melbourne	Nov 19, 2020	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Nov 19, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Nov 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Nov 21, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Nov 21, 2020	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 19, 2020 10:37 AM
Due: Nov 26, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**											
1	0083_QC201_201117	Nov 17, 2020		Soil	P20-No33907		X		X		X	X		X		
2	0083_QC202_201117	Nov 17, 2020		Water	P20-No33908	X		X		X			X	X	X	X
3	0083_QC203_201117	Nov 17, 2020		Water	P20-No33909	X		X		X			X	X	X	X
4	0083_QC204_201117	Nov 17, 2020		Water	P20-No33910	X		X		X			X	X	X	X
5	0083_QC205_201117	Nov 17, 2020		Water	P20-No33911	X		X		X			X	X	X	X
6	0083_QC206_	Nov 17, 2020		Water	P20-No33912	X		X		X			X	X	X	X

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Melbourne Laboratory - NATA Site # 1254 & 14271	X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794									X		
Perth Laboratory - NATA Site # 23736											
Mayfield Laboratory											
External Laboratory											
201117											
Test Counts	5	1	5	1	5	1	1	5	6	5	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Conductivity (1:5 aqueous extract at 25°C as rec.)	uS/cm	< 10			10	Pass	
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Cation Exchange Capacity							
Cation Exchange Capacity	meq/100g	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Conductivity (1:5 aqueous extract at 25°C as rec.)	%	95			70-130	Pass	
Total Organic Carbon	%	100			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	97			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	96			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorohexanoic acid (PFHxA)	%	105			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	97			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	81			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	107			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	96			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	104			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	115			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	106			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	92			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	78			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	115			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	99			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	102			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	102			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	121			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	111			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	94			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	108			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	107			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	107			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	143			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	105			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	99			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	90			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	131			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	114			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	103			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	142			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	P20-No33907	CP	%	78			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P20-No33907	CP	%	78			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P20-No33907	CP	%	81			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P20-No33907	CP	%	74			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P20-No33907	CP	%	64			50-150	Pass	
Perfluorononanoic acid (PFNA)	P20-No33907	CP	%	83			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P20-No33907	CP	%	79			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P20-No33907	CP	%	82			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P20-No33907	CP	%	92			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P20-No33907	CP	%	81			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P20-No33907	CP	%	73			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctane sulfonamide (FOSA)	P20-No33907	CP	%	58			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P20-No33907	CP	%	89			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P20-No33907	CP	%	73			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P20-No33907	CP	%	79			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P20-No33907	CP	%	76			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P20-No33907	CP	%	93			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P20-No33907	CP	%	92			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P20-No33907	CP	%	80			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P20-No33907	CP	%	100			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P20-No33907	CP	%	77			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P20-No33907	CP	%	76			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P20-No33907	CP	%	110			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P20-No33907	CP	%	104			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P20-No33907	CP	%	79			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P20-No33907	CP	%	91			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P20-No33907	CP	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P20-No33907	CP	%	107			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P20-No33907	CP	%	109			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P20-No33907	CP	%	106			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	M20-No36009	NCP	uS/cm	67	72	6.2	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	M20-No36009	NCP	pH Units	8.2	8.1	pass	30%	Pass	
Total Organic Carbon	M20-No35366	NCP	%	2.5	2.8	12	30%	Pass	
% Moisture	M20-No34027	NCP	%	1.4	1.0	29	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorooctanoic acid (PFOA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanoic acid (PFNA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanoic acid (PFDA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-No38723	NCP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-No38723	NCP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	B20-No38723	NCP	ug/kg	6.1	5.5	14	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-No38723	NCP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-No38723	NCP	ug/kg	< 5	< 5	<1	30%	Pass

Quality Control Analyte Summary Compliance

The table below is the actual occurrence of QC performed on the batch of samples within this report and as defined below

Analysis	Samples Analysed	Laboratory Duplicates Reported	Laboratory Matrix Spikes Reported	Method Blanks Reported	Laboratory Control Samples Reported
Conductivity (1:5 aqueous extract at 25°C as	1	1	NA	1	1
pH (1:5 Aqueous extract at 25°C as rec.)	1	1	NA	NA	NA
Total Organic Carbon	1	1	0	1	1
% Moisture	1	1	NA	NA	NA
Cation Exchange Capacity	1	0	0	1	0
Perfluoroalkyl carboxylic acids (PFCAs)	1	1	1	1	1
Perfluoroalkyl sulfonamido substances	1	1	1	1	1
Perfluoroalkyl sulfonic acids (PFSAs)	1	1	1	1	1
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	1	1	1	1	1

Quality Control Parameter Frequency Compliance follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure April 2011, Schedule B3, Guideline on Laboratory Analysis of Potentially Contaminated Soils and US EPA SW-846 Chapter 1: 'Quality Control'.

It comprises the following when a laboratory process batch is deemed to consist of up to 20 samples that are similar in terms of matrix and test procedure, and are processed as one unit for QC purposes. If more than 20 samples are being processed, they are considered as more than one batch.

Method blank

One method blank per process batch.

Laboratory duplicate

There should be at least one duplicate per process batch, or two duplicates if the process batch exceeds 10 samples.

Laboratory control sample (LCS)

There should be at least one LCS per process batch.

Matrix spikes

There should be one matrix spike per matrix type per process batch.

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Matthew Deaves	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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WA 6005

NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Attention: **David James**

Report **758001-W-V2**
Project name HEH-A
Project ID WA_0082_PFASOMP
Received Date Nov 19, 2020

Client Sample ID			**0083_QC202_201117**	**0083_QC203_201117**	**0083_QC204_201117**	**0083_QC205_201117**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**P20-No33908**	**P20-No33909**	**P20-No33910**	**P20-No33911**
Date Sampled			**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	36000	26000	15000	17000
Dissolved Organic Carbon	5	mg/L	5.2	47	< 5	25
pH (at 25 °C)	0.1	pH Units	7.8	7.9	8.0	7.9
Sulphate (as SO4)	5	mg/L	2600	2900	1600	2500
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	29000	28000	20000	20000
Total Suspended Solids Dried at 103–105°C	1	mg/L	5400	6400	260	6000
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	I/S	5600	230	58000
Carbonate Alkalinity (as CaCO3)	10	mg/L	I/S	93	< 10	2800
Hydroxide Alkalinity (as CaCO3)	20	mg/L	I/S	< 20	< 20	< 20
Total Alkalinity (as CaCO3)	20	mg/L	I/S	5700	230	61000
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	0.5	mg/L	410	350	290	470
Magnesium	0.5	mg/L	1100	1100	780	1000
Potassium	0.5	mg/L	310	330	240	350
Sodium	0.5	mg/L	9300	9100	5300	7200
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	99	95	98	97
13C5-PFPeA (surr.)	1	%	86	78	84	83
13C5-PFHxA (surr.)	1	%	99	88	88	87
13C4-PFHpA (surr.)	1	%	94	80	87	86
13C8-PFOA (surr.)	1	%	170	80	78	84
13C5-PFNA (surr.)	1	%	48	42	42	44
13C6-PFDA (surr.)	1	%	84	75	79	77

Client Sample ID			0083_QC202_201117	0083_QC203_201117	0083_QC204_201117	0083_QC205_201117
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**P20-No33908**	**P20-No33909**	**P20-No33910**	**P20-No33911**
Date Sampled			**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C2-PFUnDA (surr.)	1	%	124	105	116	121
13C2-PFDoDA (surr.)	1	%	104	85	91	91
13C2-PFTeDA (surr.)	1	%	85	51	65	59
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	100	97	95	92
D3-N-MeFOSA (surr.)	1	%	108	96	88	84
D5-N-EtFOSA (surr.)	1	%	95	83	72	69
D7-N-MeFOSE (surr.)	1	%	120	111	111	107
D9-N-EtFOSE (surr.)	1	%	130	121	118	112
D5-N-EtFOSAA (surr.)	1	%	65	60	62	62
D3-N-MeFOSAA (surr.)	1	%	55	57	58	56
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	94	89	89	87
18O2-PFHxS (surr.)	1	%	206	98	90	100
13C8-PFOS (surr.)	1	%	129	122	127	126
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	91	74	82	88
13C2-6:2 FTSA (surr.)	1	%	58	44	60	56
13C2-8:2 FTSA (surr.)	1	%	46	38	43	40
13C2-10:2 FTSA (surr.)	1	%	51	43	48	42

Client Sample ID			0083_QC202_201117	0083_QC203_201117	0083_QC204_201117	0083_QC205_201117
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**P20-No33908**	**P20-No33909**	**P20-No33910**	**P20-No33911**
Date Sampled			**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	0.01	< 0.01	< 0.01	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.01	< 0.01	< 0.01	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.01	< 0.01	< 0.01	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	< 0.1	< 0.1	< 0.1

Client Sample ID			0083_QC206_201117
Sample Matrix			**Water**
Eurofins Sample No.			**P20-No33912**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
Chloride	1	mg/L	12000
Dissolved Organic Carbon	5	mg/L	6.1
pH (at 25 °C)	0.1	pH Units	8.0
Sulphate (as SO4)	5	mg/L	1600
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	20000
Total Suspended Solids Dried at 103–105°C	1	mg/L	1200
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	710
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20
Total Alkalinity (as CaCO3)	20	mg/L	710
Eurofins Suite B11C: Na/K/Ca/Mg			
Calcium	0.5	mg/L	320
Magnesium	0.5	mg/L	750
Potassium	0.5	mg/L	230
Sodium	0.5	mg/L	4800
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	0.11
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.23
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	0.23
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	0.12
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.05
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	89
13C5-PFPeA (surr.)	1	%	68
13C5-PFHxA (surr.)	1	%	86
13C4-PFHpA (surr.)	1	%	95
13C8-PFOA (surr.)	1	%	96
13C5-PFNA (surr.)	1	%	46
13C6-PFDA (surr.)	1	%	86

Client Sample ID			0083_QC206_201117
Sample Matrix			**Water**
Eurofins Sample No.			**P20-No33912**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
13C2-PFUnDA (surr.)	1	%	119
13C2-PFDoDA (surr.)	1	%	92
13C2-PFTeDA (surr.)	1	%	50
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	95
D3-N-MeFOSA (surr.)	1	%	87
D5-N-EtFOSA (surr.)	1	%	74
D7-N-MeFOSE (surr.)	1	%	107
D9-N-EtFOSE (surr.)	1	%	109
D5-N-EtFOSAA (surr.)	1	%	63
D3-N-MeFOSAA (surr.)	1	%	58
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	0.02
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]0.20
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.24
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	92
18O2-PFHxS (surr.)	1	%	106
13C8-PFOS (surr.)	1	%	129
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	0.60
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01
13C2-4:2 FTSA (surr.)	1	%	129
13C2-6:2 FTSA (surr.)	1	%	98
13C2-8:2 FTSA (surr.)	1	%	59
13C2-10:2 FTSA (surr.)	1	%	52

Client Sample ID			0083_QC206_201117
Sample Matrix			**Water**
Eurofins Sample No.			**P20-No33912**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	0.44
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.29
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.49
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	1.8
Sum of PFASs (n=30)*	0.1	ug/L	1.81

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO4/Alkalinity			
Chloride	Melbourne	Nov 20, 2020	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO4)	Melbourne	Nov 20, 2020	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Dec 01, 2020	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Dissolved Organic Carbon	Melbourne	Nov 20, 2020	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Melbourne	Nov 20, 2020	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Nov 20, 2020	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Nov 20, 2020	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Nov 20, 2020	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Nov 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Nov 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Nov 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Nov 20, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins | Environment Testing

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Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/330
Report #: 758001
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 19, 2020 10:37 AM
Due: Nov 26, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**											
1	0083_QC201_201117	Nov 17, 2020		Soil	P20-No33907		X		X		X	X		X		
2	0083_QC202_201117	Nov 17, 2020		Water	P20-No33908	X		X		X			X	X	X	X
3	0083_QC203_201117	Nov 17, 2020		Water	P20-No33909	X		X		X			X	X	X	X
4	0083_QC204_201117	Nov 17, 2020		Water	P20-No33910	X		X		X			X	X	X	X
5	0083_QC205_201117	Nov 17, 2020		Water	P20-No33911	X		X		X			X	X	X	X
6	0083_QC206_	Nov 17, 2020		Water	P20-No33912	X		X		X			X	X	X	X

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Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/330
Report #: 758001
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 19, 2020 10:37 AM
Due: Nov 26, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail	Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271	X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794									X		
Perth Laboratory - NATA Site # 23736											
Mayfield Laboratory											
External Laboratory											
201117											
Test Counts	5	1	5	1	5	1	1	5	6	5	5

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO4)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	103			70-130	Pass	
Sulphate (as SO4)	%	111			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	98			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	86			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	86			70-130	Pass	
Total Alkalinity (as CaCO3)	%	91			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	99			80-120	Pass	
Magnesium	%	91			80-120	Pass	
Potassium	%	90			80-120	Pass	
Sodium	%	112			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	114			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	94			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	89			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	97			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	84			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	111			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	98			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	95			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	110			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	88			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	83			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	80			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	95			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	102			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	107			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	95			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	106			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	98			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	91			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	91			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	97			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	102			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	121			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	80			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	111			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	87			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	112			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	94			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	107			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	72			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S20-No32766	NCP	%	125			70-130	Pass	
Sulphate (as SO4)	M20-No32003	NCP	%	114			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	B20-No32960	NCP	%	110			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Carbonate Alkalinity (as CaCO3)	M20-No35863	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	M20-No37028	NCP	%	101			75-125	Pass	
Magnesium	P20-No33965	NCP	%	105			75-125	Pass	
Potassium	P20-No33965	NCP	%	88			75-125	Pass	
Sodium	M20-No38719	NCP	%	107			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	S20-No32944	NCP	%	104			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S20-No32944	NCP	%	95			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S20-No32944	NCP	%	89			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-No32944	NCP	%	91			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S20-No32944	NCP	%	80			50-150	Pass	
Perfluorononanoic acid (PFNA)	S20-No32944	NCP	%	102			50-150	Pass	
Perfluorodecanoic acid (PFDA)	S20-No32944	NCP	%	87			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-No32944	NCP	%	91			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-No32944	NCP	%	99			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-No32944	NCP	%	78			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-No32944	NCP	%	84			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	S20-No32944	NCP	%	72			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-No32944	NCP	%	87			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-No32944	NCP	%	94			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-No32944	NCP	%	98			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-No32944	NCP	%	87			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-No32944	NCP	%	96			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-No32944	NCP	%	100			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S20-No32944	NCP	%	88			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-No32944	NCP	%	77			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-No32944	NCP	%	96			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-No32944	NCP	%	94			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorohexanesulfonic acid (PFHxS)	S20-No32944	NCP	%	109			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-No32944	NCP	%	74			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-No32944	NCP	%	101			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-No32944	NCP	%	77			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-No32944	NCP	%	98			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-No32944	NCP	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-No32944	NCP	%	103			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-No32944	NCP	%	79			50-150	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Bicarbonate Alkalinity (as CaCO3)	S20-No43651	NCP	%	110			70-130	Pass	
Total Alkalinity (as CaCO3)	S20-No43661	NCP	%	112			70-130	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Dissolved Organic Carbon	M20-No27253	NCP	mg/L	< 5	< 5	<1	30%	Pass	
pH (at 25 °C)	M20-No32564	NCP	pH Units	8.1	8.1	pass	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	P20-No33908	CP	mg/L	29000	28000	5.9	30%	Pass	
Total Suspended Solids Dried at 103–105°C	M20-No33628	NCP	mg/L	< 1	4.8	200	30%	Fail	Q15
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M20-No32564	NCP	mg/L	400	410	2.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M20-No32564	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	M20-No32564	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M20-No32564	NCP	mg/L	400	410	2.0	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	P20-No33965	NCP	mg/L	9.3	12	23	30%	Pass	
Magnesium	P20-No33965	NCP	mg/L	5.1	9.1	56	30%	Fail	Q02
Potassium	P20-No33965	NCP	mg/L	18	17	5.0	30%	Pass	
Sodium	M20-No38719	NCP	mg/L	84	87	1.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorododecanoic acid (PFDoDA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-No32943	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	P20-No33912	CP	mg/L	12000	15000	29	30%	Pass	
Sulphate (as SO4)	P20-No33912	CP	mg/L	1600	1600	4.0	30%	Pass	

Comments

V2 report issued with updated alkalinity result for No33908.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised By

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012741**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16086	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 19-Nov-2020 10:50	Issue Date	: 19-Nov-2020
Client Requested Due Date	: 30-Nov-2020	Scheduled Reporting Date	: **30-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 8.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2012741-001	17-Nov-2020 13:55	0083_SD128_201117	✓	✓	✓	✓
EP2012741-002	17-Nov-2020 14:06	0083_SD127_201117	✓	✓	✓	✓
EP2012741-003	17-Nov-2020 14:13	0083_QC101_201117	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DAVID JAMES		
- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALSCompass SAMPLING Intelligence

Environmental Division
Perth
Work Order Reference
EP2012741

Telephone : +61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEP19009 **Client:** CITRONO **Project Manager:** M. Bowden
Phone: ( )

ALS Compass COC Reference: LC 29 **# Samples:** **Sampler:** S. McCulloch
16099, 16098 **Phone:** ( )

Turnaround Requirements: Standard Urgent

Special Instructions:	ALS Use Only			
	Custody seal intact?	YES	NO	N/A
	Free ice / frozen ice bricks upon receipt?	YES	NO	N/A
	Random sample temperature on receipt?	8.6	°C	

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
			RMoore
Date / Time:	**Date / Time:**	**Date / Time:**	**Date / Time:**
18/11/20			19.11.20 1050

CHAIN OF CUSTODY

(ALS) COC#: **16086** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA SED

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
~~001~~	~~0083_SD128~~		~~17/11/2020 01:55 PM~~	~~Soil~~	~~ALS: 2 Non ALS: 0~~	~~No~~	X		
002	0083_SD127		17/11/2020 02:06 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0083_QC101		17/11/2020 02:13 PM	Soil	ALS: 2 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: **16086** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD128	Soil Glass Jar - Unpreserved	150 mL	00260520072473	Orange	No	
001	0083_SD128	HDPE Soil Jar	200 mL	00621019038115	Grey	No	
002	0083_SD127	HDPE Soil Jar	200 mL	00621019018355	Grey	No	
002	0083_SD127	Soil Glass Jar - Unpreserved	150 mL	00260520053145	Orange	No	
003	0083_QC101	Soil Glass Jar - Unpreserved	150 mL	00260520053172	Orange	No	
003	0083_QC101	HDPE Soil Jar	200 mL	00621019038126	Grey	No	

Total Bottle Count: ALS: 6, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012741**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020 10:50
Order number	: DEF19009/0083	Date Analysis Commenced	: 23-Nov-2020
C-O-C number	: 16086	Issue Date	: 30-Nov-2020 16:08
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD128_201117	0083_SD127_201117	0083_QC101_201117	----	----
			Sampling date / time	17-Nov-2020 13:55	17-Nov-2020 14:06	17-Nov-2020 14:13	----	----
Compound	CAS Number	LOR	Unit	EP2012741-001	EP2012741-002	EP2012741-003	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**9.3**	**9.0**	**8.9**	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**26400**	**9500**	**5870**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**9.3**	**6.5**	**5.3**	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**54.7**	**34.3**	**50.6**	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**6.1**	**1.3**	**2.6**	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.1**	<0.1	<0.1	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.9**	**0.2**	**0.4**	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**61.8**	**35.9**	**53.6**	----	----
Exchangeable Sodium Percent	----	0.1	%	**1.4**	**0.7**	**0.7**	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**1.8**	**1.2**	**1.2**	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD128_201117	0083_SD127_201117	0083_QC101_201117	----	----
				Sampling date / time	17-Nov-2020 13:55	17-Nov-2020 14:06	17-Nov-2020 14:13	----	----
Compound	CAS Number	LOR	Unit		EP2012741-001	EP2012741-002	EP2012741-003	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD128_201117	0083_SD127_201117	0083_QC101_201117	----	----
			Sampling date / time	17-Nov-2020 13:55	17-Nov-2020 14:06	17-Nov-2020 14:13	----	----
Compound	CAS Number	LOR	Unit	EP2012741-001	EP2012741-002	EP2012741-003	--------	--------
				Result	Result	Result	----	----
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**90.5**	**92.0**	**93.0**	----	----
13C8-PFOA	----	0.0002	%	**97.0**	**93.5**	**100**	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012741**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 23-Nov-2020
C-O-C number	: 16086	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3381257)									
EP2012741-001	0083_SD128_201117	EA002: pH Value	----	0.1	pH Unit	9.3	9.6	2.86	0% - 20%
EP2012893-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.5	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381256)									
EP2012741-001	0083_SD128_201117	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	26400	26600	0.755	0% - 20%
EP2012893-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	166	166	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381260)									
EP2012741-001	0083_SD128_201117	EA055: Moisture Content	----	0.1	%	9.3	7.9	16.1	0% - 20%
EP2013001-006	Anonymous	EA055: Moisture Content	----	0.1	%	3.1	3.2	4.08	No Limit
ED008: Exchangeable Cations (QC Lot: 3385244)									
EP2012741-001	0083_SD128_201117	ED008: Exchangeable Sodium Percent	----	0.1	%	1.4	1.3	7.27	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	54.7	54.9	0.367	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	6.1	7.1	15.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	61.8	63.0	1.86	0% - 20%
EP2012895-004	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.9	0.8	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.3	21.6	3.14	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.7	3.4	6.70	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	26.8	25.8	3.70	0% - 20%
EP004: Organic Matter (QC Lot: 3381247)									
EP2012741-001	0083_SD128_201117	EP004: Organic Matter	----	0.5	%	1.8	1.7	7.19	No Limit
EP2013001-007	Anonymous	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3378743)									
EP2012741-001	0083_SD128_201117	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES2041170-012	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0007	0.0006	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3378743)									
EP2012741-001	0083_SD128_201117	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES2041170-012	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0002	0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0006	0.0006	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3378743)									
EP2012741-001	0083_SD128_201117	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3378743) - continued									
EP2012741-001	0083_SD128_201117	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES2041170-012	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3378743)									
EP2012741-001	0083_SD128_201117	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES2041170-012	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3381257)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	102	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3381256)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED008: Exchangeable Cations (QCLot: 3385244)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	95.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	119	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	96.4	79.9	110
EP004: Organic Matter (QCLot: 3381247)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	92.2	70.0	120
				<0.5	85 %	91.6	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3378743)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.6	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3378743)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	93.5	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.6	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.4	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.0	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.4	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.0	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3378743)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3378743) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	101	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	85.9	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	103	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.2	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3378743)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	84.0	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	92.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.4	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	96.0	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3378743)							
EP2012741-001	0083_SD128_201117	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	81.2	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	92.0	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	106	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	112	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	82.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	118	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3378743)							
EP2012741-001	0083_SD128_201117	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	87.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	84.4	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	87.6	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	90.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	95.2	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	88.8	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	93.6	69.0	133

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3378743) - continued							
EP2012741-001	0083_SD128_201117	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	93.2	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	95.2	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	87.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	93.9	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3378743)							
EP2012741-001	0083_SD128_201117	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	87.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	94.6	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	88.3	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	93.1	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	84.8	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	92.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	85.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3378743)							
EP2012741-001	0083_SD128_201117	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	92.4	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	92.0	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	108	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012741**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 3
Order number	: DEF19009/0083	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved							
0083_SD128_201117, 0083_QC101_201117	0083_SD127_201117,	25-Nov-2020	24-Nov-2020	1	----	----	----
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved							
0083_SD128_201117, 0083_QC101_201117	0083_SD127_201117,	25-Nov-2020	24-Nov-2020	1	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0083_SD128_201117, 0083_QC101_201117	0083_SD127_201117,	**17-Nov-2020**	**25-Nov-2020**	24-Nov-2020	×	**25-Nov-2020**	25-Nov-2020	✓
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0083_SD128_201117, 0083_QC101_201117	0083_SD127_201117,	**17-Nov-2020**	**25-Nov-2020**	24-Nov-2020	×	**25-Nov-2020**	23-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0083_SD128_201117, 0083_QC101_201117	0083_SD127_201117,	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	01-Dec-2020	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0083_SD128_201117, 0083_QC101_201117	0083_SD127_201117,	**17-Nov-2020**	**27-Nov-2020**	15-Dec-2020	✓	**27-Nov-2020**	15-Dec-2020	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0083_SD128_201117, 0083_SD127_201117, 0083_QC101_201117	**17-Nov-2020**	**27-Nov-2020**	15-Dec-2020	✓	**27-Nov-2020**	15-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD128_201117, 0083_SD127_201117, 0083_QC101_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0083_SD128_201117, 0083_SD127_201117, 0083_QC101_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0083_SD128_201117, 0083_SD127_201117, 0083_QC101_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD128_201117, 0083_SD127_201117, 0083_QC101_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0083_SD128_201117, 0083_SD127_201117, 0083_QC101_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012742**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16094	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 19-Nov-2020 10:50	Issue Date	: 19-Nov-2020
Client Requested Due Date	: 30-Nov-2020	Scheduled Reporting Date	: **30-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 8.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 14 / 14

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012742-001	17-Nov-2020 14:29	0083_MW117_201117	✓	✓	✓	✓	✓	✓	✓
EP2012742-002	17-Nov-2020 14:45	0083_OTH108_201117	✓	✓	✓	✓	✓	✓	✓
EP2012742-003	17-Nov-2020 15:21	0083_OTH107_201117	✓	✓	✓	✓	✓	✓	✓
EP2012742-004	17-Nov-2020 15:32	0083_OTH106_201117	✓	✓	✓	✓	✓	✓	✓
EP2012742-005	17-Nov-2020 15:42	0083_OTH105_201117	✓	✓	✓	✓	✓	✓	✓
EP2012742-006	17-Nov-2020 16:25	0083_MW107_201117	✓	✓	✓	✓	✓	✓	✓
EP2012742-007	17-Nov-2020 16:37	0083_OTH002_201117	✓	✓	✓	✓		✓	✓
EP2012742-008	17-Nov-2020 16:46	0083_OTH103_201117	✓	✓	✓	✓		✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012742-001	17-Nov-2020 14:29	0083_MW117_201117		✓
EP2012742-002	17-Nov-2020 14:45	0083_OTH108_201117		✓
EP2012742-003	17-Nov-2020 15:21	0083_OTH107_201117		✓
EP2012742-004	17-Nov-2020 15:32	0083_OTH106_201117		✓
EP2012742-005	17-Nov-2020 15:42	0083_OTH105_201117		✓
EP2012742-006	17-Nov-2020 16:25	0083_MW107_201117		✓
EP2012742-007	17-Nov-2020 16:37	0083_OTH002_201117	✓	✓
EP2012742-008	17-Nov-2020 16:46	0083_OTH103_201117	✓	✓
EP2012742-009	17-Nov-2020 17:30	0083_QC301_201117		✓
EP2012742-010	17-Nov-2020 17:31	0083_QC302_201117		✓
EP2012742-011	17-Nov-2020 17:32	0083_QC303_201117		✓
EP2012742-012	17-Nov-2020 17:32	0083_QC401_201117		✓
EP2012742-013	17-Nov-2020 17:33	0083_QC402_201117		✓
EP2012742-014	17-Nov-2020 17:34	0083_QC403_201117		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0083_MW107_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0083_MW117_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0083_OTH002_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0083_OTH103_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0083_OTH105_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0083_OTH106_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0083_OTH107_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0083_OTH108_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALSCompass SAMPLING Intelligence

Environmental Division
Perth
Work Order Reference
EP2012742

Telephone : +61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: OEP19009 **Client:** CITRONO **Project Manager:** M. Bowden
Phone: ( )

ALS Compass COC Reference: 16099 **# Samples:** **Sampler:** S. McCulloch
16099, 16098 **Phone:** ( )

Turnaround Requirements: (Standard) Urgent

Special Instructions:	ALS Use Only			
	Custody seal intact?	YES	NO	(N/A)
	Free ice / frozen ice bricks upon receipt?	(YES)	NO	N/A
	Random sample temperature on receipt?	8.6	°C	

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
			[illegible]
Date / Time:	**Date / Time:**	**Date / Time:**	**Date / Time:**
18/11/20			19.11.20 1050

CHAIN OF CUSTODY

(ALS) *COC#:* **16094** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
~~001~~	~~0083_MW117~~		~~17/11/2020 02:29 PM~~	~~Water~~	~~ALS: 4 Non ALS: 0~~	~~No~~	~~X~~			
002	0083_OTH108		17/11/2020 02:45 PM	Water	ALS: 6 Non ALS: 0	No	X			
003	0083_OTH107		17/11/2020 03:21 PM	Water	ALS: 4 Non ALS: 0	No	X			
004	0083_OTH106		17/11/2020 03:32 PM	Water	ALS: 4 Non ALS: 0	No	X			
005	0083_OTH105		17/11/2020 03:42 PM	Water	ALS: 4 Non ALS: 0	No	X			
006	0083_MW107		17/11/2020 04:25 PM	Water	ALS: 4 Non ALS: 0	No	X			
007	0083_OTH002	could not filter	17/11/2020 04:37 PM	Water	ALS: 4 Non ALS: 0	No	X			
008	0083_OTH103		17/11/2020 04:46 PM	Water	ALS: 4 Non ALS: 0	No	X			
009	0083_QC301		17/11/2020 05:30 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

COC#: **16094** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0083_QC302		17/11/2020 05:31 PM	Water	ALS: 2 Non ALS: 0	No		X		
011	0083_QC303		17/11/2020 05:32 PM	Water	ALS: 2 Non ALS: 0	No		X		
012	0083_QC401		17/11/2020 05:32 PM	Water	ALS: 2 Non ALS: 0	No		X		
013	0083_QC402		17/11/2020 05:33 PM	Water	ALS: 2 Non ALS: 0	No		X		
014	0083_QC403		17/11/2020 05:34 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

ALS COC#: 16094 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW117	Clear Plastic Bottle - Natural	250 mL	00070719042781	Green	No	
001	0083_MW117	HDPE (no PTFE)	20 mL	00352005016099	Grey	No	
001	0083_MW117	HDPE (no PTFE)	20 mL	00352005016061	Grey	No	
001	0083_MW117	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023294	Purple	No	
002	0083_OTH108	Clear Plastic Bottle - Natural	250 mL	00070719042710	Green	No	
002	0083_OTH108	HDPE (no PTFE)	20 mL	00352005007008	Grey	No	
002	0083_OTH108	HDPE (no PTFE)	20 mL	00352005016098	Grey	No	
002	0083_OTH108	HDPE (no PTFE)	20 mL	00352005016101	Grey	No	
~~002~~	~~0083_OTH108~~	~~HDPE (no PTFE)~~	~~20 mL~~	~~00352005006978~~	~~Grey~~	~~No~~	
002	0083_OTH108	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023411	Purple	No	
003	0083_OTH107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023732	Purple	No	
003	0083_OTH107	Clear Plastic Bottle - Natural	250 mL	00070719042936	Green	No	
003	0083_OTH107	HDPE (no PTFE)	20 mL	00350019106828	Grey	No	
003	0083_OTH107	HDPE (no PTFE)	20 mL	00350019106810	Grey	No	
004	0083_OTH106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023760	Purple	No	
004	0083_OTH106	Clear Plastic Bottle - Natural	250 mL	00070719042861	Green	No	
004	0083_OTH106	HDPE (no PTFE)	20 mL	00350019106897	Grey	No	
004	0083_OTH106	HDPE (no PTFE)	20 mL	00350019106708	Grey	No	
005	0083_OTH105	Clear Plastic Bottle - Natural	250 mL	00070719042914	Green	No	
005	0083_OTH105	HDPE (no PTFE)	20 mL	00350019106834	Grey	No	
005	0083_OTH105	HDPE (no PTFE)	20 mL	00350019106751	Grey	No	
005	0083_OTH105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023713	Purple	No	
006	0083_MW107	HDPE (no PTFE)	20 mL	00352005016328	Grey	No	
006	0083_MW107	HDPE (no PTFE)	20 mL	00352005016298	Grey	No	
006	0083_MW107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056645	Purple	No	
006	0083_MW107	Clear Plastic Bottle - Natural	250 mL	00070719042837	Green	No	

CHAIN OF CUSTODY

ALS COC#: **16094** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au

007	0083_OTH002	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023708	Purple	No	
007	0083_OTH002	HDPE (no PTFE)	20 mL	00350019106703	Grey	No	
007	0083_OTH002	HDPE (no PTFE)	20 mL	00350019106686	Grey	No	
007	0083_OTH002	Clear Plastic Bottle - Natural	250 mL	00070719042884	Green	No	
008	0083_OTH103	Clear Plastic Bottle - Natural	250 mL	00070719042941	Green	No	
008	0083_OTH103	HDPE (no PTFE)	20 mL	00350019106727	Grey	No	
008	0083_OTH103	HDPE (no PTFE)	20 mL	00350019106781	Grey	No	
008	0083_OTH103	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023657	Purple	No	
009	0083_QC301	HDPE (no PTFE)	20 mL	00352005005297	Grey	No	
009	0083_QC301	HDPE (no PTFE)	20 mL	00352005005294	Grey	No	
010	0083_QC302	HDPE (no PTFE)	20 mL	00352005005093	Grey	No	
010	0083_QC302	HDPE (no PTFE)	20 mL	00352005005332	Grey	No	
011	0083_QC303	HDPE (no PTFE)	20 mL	00352005005178	Grey	No	
011	0083_QC303	HDPE (no PTFE)	20 mL	00352005005289	Grey	No	
012	0083_QC401	HDPE (no PTFE)	20 mL	00352005006417	Grey	No	
012	0083_QC401	HDPE (no PTFE)	20 mL	00352005005162	Grey	No	
013	0083_QC402	HDPE (no PTFE)	20 mL	00352005006337	Grey	No	
013	0083_QC402	HDPE (no PTFE)	20 mL	00352005006479	Grey	No	
014	0083_QC403	HDPE (no PTFE)	20 mL	00352005006466	Grey	No	
014	0083_QC403	HDPE (no PTFE)	20 mL	00352005005316	Grey	No	

Total Bottle Count: ALS: 46, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012742**	Page	: 1 of 13
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020 10:50
Order number	: DEF19009/0083	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16094	Issue Date	: 30-Nov-2020 17:43
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 14		
No. of samples analysed	: 14		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231X: Positive result for analyte Perfluorooctane sulfonic acid (PFOS) on sample EP2012742_006 (0083_MW107_201117) has been confirmed by re-extraction and re-analysis.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW117_201117	0083_OTH108_201117	0083_OTH107_201117	0083_OTH106_201117	0083_OTH105_201117
				Sampling date / time	17-Nov-2020 14:29	17-Nov-2020 14:45	17-Nov-2020 15:21	17-Nov-2020 15:32	17-Nov-2020 15:42
Compound	CAS Number	LOR	Unit		EP2012742-001	EP2012742-002	EP2012742-003	EP2012742-004	EP2012742-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.72	7.90	8.05	8.09	8.05
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		38900	39000	35800	39000	38900
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		23300	590	166	66	255
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		128	154	116	116	116
Total Alkalinity as CaCO3	----	1	mg/L		128	154	116	116	116
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2810	2760	2770	2790	2790
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19100	19800	19700	19800	19800
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		510	479	495	496	496
Magnesium	7439-95-4	1	mg/L		1590	1480	1530	1540	1540
Sodium	7440-23-5	1	mg/L		12400	11500	11800	11900	11900
Potassium	7440-09-7	1	mg/L		682	634	652	652	649
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		600	619	616	619	619
ø Total Cations	----	0.01	meq/L		713	662	680	686	686
ø Ionic Balance	----	0.01	%		8.63	3.36	5.00	5.12	5.12
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		<1	4	2	2	2
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW117_201117	0083_OTH108_201117	0083_OTH107_201117	0083_OTH106_201117	0083_OTH105_201117
				Sampling date / time	17-Nov-2020 14:29	17-Nov-2020 14:45	17-Nov-2020 15:21	17-Nov-2020 15:32	17-Nov-2020 15:42
					EP2012742-001	EP2012742-002	EP2012742-003	EP2012742-004	EP2012742-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW117_201117	0083_OTH108_201117	0083_OTH107_201117	0083_OTH106_201117	0083_OTH105_201117
				Sampling date / time	17-Nov-2020 14:29	17-Nov-2020 14:45	17-Nov-2020 15:21	17-Nov-2020 15:32	17-Nov-2020 15:42
					EP2012742-001	EP2012742-002	EP2012742-003	EP2012742-004	EP2012742-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**113**	**104**	**105**	**116**	**108**
13C8-PFOA	----	0.02	%		**104**	**102**	**98.2**	**104**	**100**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW107_201117	0083_OTH002_201117	0083_OTH103_201117	----	----
				Sampling date / time	17-Nov-2020 16:25	17-Nov-2020 16:37	17-Nov-2020 16:46	----	----
Compound	CAS Number	LOR	Unit		EP2012742-006	EP2012742-007	EP2012742-008	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.68	8.01	8.03	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		38400	38100	38800	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		2020	91	43	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		166	119	118	----	----
Total Alkalinity as CaCO3	----	1	mg/L		166	119	118	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2770	2830	2830	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19500	19700	19700	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		498	496	464	----	----
Magnesium	7439-95-4	1	mg/L		1450	1550	1450	----	----
Sodium	7440-23-5	1	mg/L		11300	11900	11200	----	----
Potassium	7440-09-7	1	mg/L		621	663	616	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		611	617	617	----	----
ø Total Cations	----	0.01	meq/L		652	687	645	----	----
ø Ionic Balance	----	0.01	%		3.21	5.36	2.25	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		21	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	4	2	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW107_201117	0083_OTH002_201117	0083_OTH103_201117	----	----
				Sampling date / time	17-Nov-2020 16:25	17-Nov-2020 16:37	17-Nov-2020 16:46	----	----
Compound	CAS Number	LOR	Unit		EP2012742-006	EP2012742-007	EP2012742-008	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.05**	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW107_201117	0083_OTH002_201117	0083_OTH103_201117	----	----
				Sampling date / time	17-Nov-2020 16:25	17-Nov-2020 16:37	17-Nov-2020 16:46	----	----
Compound	CAS Number	LOR	Unit		EP2012742-006	EP2012742-007	EP2012742-008	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.05**	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.05**	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.05**	<0.01	<0.01	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**111**	**113**	**106**	----	----
13C8-PFOA	----	0.02	%		**106**	**103**	**97.6**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC301_201117	0083_QC302_201117	0083_QC303_201117	0083_QC401_201117	0083_QC402_201117
				Sampling date / time	17-Nov-2020 17:30	17-Nov-2020 17:31	17-Nov-2020 17:32	17-Nov-2020 17:32	17-Nov-2020 17:33
Compound	CAS Number	LOR	Unit		EP2012742-009	EP2012742-010	EP2012742-011	EP2012742-012	EP2012742-013
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_QC301_201117	0083_QC302_201117	0083_QC303_201117	0083_QC401_201117	0083_QC402_201117
				Sampling date / time	17-Nov-2020 17:30	17-Nov-2020 17:31	17-Nov-2020 17:32	17-Nov-2020 17:32	17-Nov-2020 17:33
					EP2012742-009	EP2012742-010	EP2012742-011	EP2012742-012	EP2012742-013
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**105**	**102**	**104**	**106**	**106**
13C8-PFOA	----	0.02	%		**102**	**102**	**99.3**	**101**	**99.3**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC403_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 17:34	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012742-014	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC403_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 17:34	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012742-014	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**103**	----	----	----	----
13C8-PFOA	----	0.02	%		**106**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012742**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16094	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 14		
No. of samples analysed	: 14		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3388980)									
EP2012739-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.09	8.12	0.370	0% - 20%
EP2012742-005	0083_OTH105_201117	EA005-P: pH Value	----	0.01	pH Unit	8.05	8.04	0.124	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3380140)									
EP2012739-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	803	800	0.374	0% - 20%
EP2012742-007	0083_OTH002_201117	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	38100	38300	0.393	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3380141)									
EP2012739-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	154	130	16.9	0% - 20%
EP2012749-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	328	291	11.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3388979)									
EP2012739-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	556	553	0.653	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	556	553	0.653	0% - 20%
EP2012742-005	0083_OTH105_201117	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	116	119	2.54	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	116	119	2.54	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373829)									
EP2012739-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	147	147	0.00	0% - 20%
EP2012742-004	0083_OTH106_201117	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2790	2770	0.794	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373830)									
EP2012739-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	508	509	0.252	0% - 20%
EP2012742-004	0083_OTH106_201117	ED045G: Chloride	16887-00-6	1	mg/L	19800	19800	0.242	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3375140)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 3375140) - continued									
EP2012738-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	615	627	2.01	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1240	1250	1.12	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10800	11000	0.974	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	549	555	1.09	0% - 20%
EP2012739-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	18	17	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	10	10	0.00	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	521	506	3.06	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	26	25	4.32	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3375141)									
EP2012742-005	0083_OTH105_201117	ED093F: Calcium	7440-70-2	1	mg/L	496	498	0.380	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1540	1550	0.0744	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11900	11900	0.582	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	649	662	2.01	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3379028)									
EP2012738-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	<1	0.00	No Limit
EP2012739-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	2	62.3	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3384091)									
EP2012742-005	0083_OTH105_201117	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2012749-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	1	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3376202)									
EP2012742-007	0083_OTH002_201117	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP2012884-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3385762)									
EP2012742-002	0083_OTH108_201117	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3385762)									
EP2012742-002	0083_OTH108_201117	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3385762) - continued									
EP2012742-002	0083_OTH108_201117	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3385762)									
EP2012742-002	0083_OTH108_201117	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3385762)									
EP2012742-002	0083_OTH108_201117	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3385762)									
EP2012742-002	0083_OTH108_201117	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3388980)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3380140)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.5	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3380141)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	107	89.1	120
				<5	1000 mg/L	99.6	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3388979)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	111	81.2	126
				<1	200 mg/L	98.2	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373829)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	97.6	87.7	113
				<1	500 mg/L	105	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373830)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	93.0	87.9	114
				<1	1000 mg/L	103	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3375140)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	99.1	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.9	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3375141)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.5	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.9	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.7	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3379028)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	102	73.2	116
				<1	100 mg/L	102	73.2	116

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	104	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3376202)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	108	87.2	116
				<1	100 mg/L	105	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3385762)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	84.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	94.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	87.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	89.2	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	94.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3385762)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	87.9	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	98.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	101	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	99.0	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	95.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	98.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	88.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	92.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3385762)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	92.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	109	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	104	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	110	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	98.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	94.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	88.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3385762)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	88.0	63.0	143

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3385762) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	96.2	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	91.4	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373829)							
EP2012739-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	103	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373830)							
EP2012739-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	100	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3379028)							
EP2012738-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)							
EP2012742-006	0083_MW107_201117	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3376202)							
EP2012742-008	0083_OTH103_201117	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3385762)							
EP2012748-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	92.2	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	100	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	92.4	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	91.4	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	94.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	94.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3385762)							
EP2012748-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	92.5	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	101	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	102	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	108	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	106	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	95.6	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	96.4	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	107	69.0	133

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3385762) - continued							
EP2012748-002	Anonymous	EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	120	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	99.4	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	87.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3385762)							
EP2012748-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	89.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	108	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	108	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	112	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	102	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	91.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3385762)							
EP2012748-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	92.4	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	112	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	113	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	111	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012742**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 14
Order number	: DEF19009/0083	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW117_201117,	0083_OTH108_201117,	----	----	----	27-Nov-2020	17-Nov-2020	**10**
0083_OTH107_201117,	0083_OTH106_201117,						
0083_OTH105_201117,	0083_MW107_201117,						
0083_OTH002_201117,	0083_OTH103_201117						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	19	5.26	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	17-Nov-2020	×
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	01-Dec-2020	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	24-Nov-2020	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**----**	----	----	**23-Nov-2020**	15-Dec-2020	✓
0083_OTH107_201117,	0083_OTH106_201117							
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_OTH105_201117,	0083_MW107_201117	**17-Nov-2020**	**----**	----	----	**25-Nov-2020**	15-Dec-2020	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0083_OTH002_201117,	0083_OTH103_201117	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	15-Dec-2020	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117,							
0083_QC301_201117,	0083_QC302_201117,							
0083_QC303_201117,	0083_QC401_201117,							
0083_QC402_201117,	0083_QC403_201117							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117,							
0083_QC301_201117,	0083_QC302_201117,							
0083_QC303_201117,	0083_QC401_201117,							
0083_QC402_201117,	0083_QC403_201117							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117,							
0083_QC301_201117,	0083_QC302_201117,							
0083_QC303_201117,	0083_QC401_201117,							
0083_QC402_201117,	0083_QC403_201117							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117,							
0083_QC301_201117,	0083_QC302_201117,							
0083_QC303_201117,	0083_QC401_201117,							
0083_QC402_201117,	0083_QC403_201117							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_MW117_201117,	0083_OTH108_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_OTH107_201117,	0083_OTH106_201117,							
0083_OTH105_201117,	0083_MW107_201117,							
0083_OTH002_201117,	0083_OTH103_201117,							
0083_QC301_201117,	0083_QC302_201117,							
0083_QC303_201117,	0083_QC401_201117,							
0083_QC402_201117,	0083_QC403_201117							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	3	30	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	**5.56**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012743**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16098	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 19-Nov-2020 10:50	Issue Date	: 19-Nov-2020
Client Requested Due Date	: 30-Nov-2020	Scheduled Reporting Date	: **30-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 8.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 8 / 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012743-001	17-Nov-2020 14:35	0083_MW129_201117	✓	✓	✓	✓	✓	✓	✓
EP2012743-002	17-Nov-2020 14:36	0083_QC102_201117	✓	✓	✓	✓	✓	✓	✓
EP2012743-003	17-Nov-2020 15:06	0083_MW130_201117	✓	✓	✓	✓		✓	✓
EP2012743-004	17-Nov-2020 15:08	0083_QC103_201117	✓	✓	✓	✓		✓	✓
EP2012743-005	17-Nov-2020 15:40	0083_MW134_201117	✓	✓	✓	✓		✓	✓
EP2012743-006	17-Nov-2020 15:43	0083_QC105_201117	✓	✓	✓	✓		✓	✓
EP2012743-007	17-Nov-2020 16:18	0083_OTH113_201117	✓	✓	✓	✓	✓	✓	✓
EP2012743-008	17-Nov-2020 17:01	0083_MW218_201117	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012743-001	17-Nov-2020 14:35	0083_MW129_201117		✓
EP2012743-002	17-Nov-2020 14:36	0083_QC102_201117		✓
EP2012743-003	17-Nov-2020 15:06	0083_MW130_201117	✓	✓
EP2012743-004	17-Nov-2020 15:08	0083_QC103_201117	✓	✓
EP2012743-005	17-Nov-2020 15:40	0083_MW134_201117	✓	✓
EP2012743-006	17-Nov-2020 15:43	0083_QC105_201117	✓	✓
EP2012743-007	17-Nov-2020 16:18	0083_OTH113_201117		✓
EP2012743-008	17-Nov-2020 17:01	0083_MW218_201117		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							

0083_MW129_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW130_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW134_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW218_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_OTH113_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_QC102_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_QC103_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_QC105_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALSCompass
SAMPLING Intelligence

ALS

Environmental Division
Perth
Work Order Reference
EP2012743

Telephone : +61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEP19009 **Client:** CITRONO **Project Manager:** M. Bowden
Phone: ( )

ALS Compass COC Reference: 16099 **# Samples:** **Sampler:** S. McCulloch
16099, 16098 **Phone:** ( )

Turnaround Requirements: Standard Urgent

Special Instructions:	ALS Use Only			
	Custody seal intact?	YES	NO	N/A
	Free ice / frozen ice bricks upon receipt?	YES	NO	N/A
	Random sample temperature on receipt?	8.6	°C	

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
			RMoore
Date / Time: 18/11/20	**Date / Time:**	**Date / Time:**	**Date / Time:** 19-11-20 1050.

CHAIN OF CUSTODY

ALS COC#: 16098 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_MW129		17/11/2020 02:35 PM	Water	ALS: 4 Non ALS: 0	No	X			
002	0083_QC102		17/11/2020 02:36 PM	Water	ALS: 4 Non ALS: 0	No	X			
003	0083_MW130		17/11/2020 03:06 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
004	0083_QC103		17/11/2020 03:08 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
005	0083_MW134		17/11/2020 03:40 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
006	0083_QC105		17/11/2020 03:43 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
007	0083_OTH113		17/11/2020 04:18 PM	Water	ALS: 4 Non ALS: 0	No	X			
008	0083_MW218		17/11/2020 05:01 PM	Water	ALS: 4 Non ALS: 0	No	X			

CHAIN OF CUSTODY

ALS COC#: 16098 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
003	0083_MW130	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)
004	0083_QC103	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)
005	0083_MW134	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)
006	0083_QC105	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)

CHAIN OF CUSTODY

(ALS) COC#: **16098** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW129	Clear Plastic Bottle - Natural	250 mL	00070719042896	Green	No	
001	0083_MW129	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023492	Purple	No	
001	0083_MW129	HDPE (no PTFE)	20 mL	00350019106920	Grey	No	
001	0083_MW129	HDPE (no PTFE)	20 mL	00350019106836	Grey	No	
002	0083_QC102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023687	Purple	No	
002	0083_QC102	Clear Plastic Bottle - Natural	250 mL	00070719042885	Green	No	
002	0083_QC102	HDPE (no PTFE)	20 mL	00350019106719	Grey	No	
002	0083_QC102	HDPE (no PTFE)	20 mL	00350019106694	Grey	No	
003	0083_MW130	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023583	Purple	No	
003	0083_MW130	Clear Plastic Bottle - Natural	250 mL	00070719042839	Green	No	
003	0083_MW130	HDPE (no PTFE)	20 mL	00350019106663	Grey	No	
003	0083_MW130	HDPE (no PTFE)	20 mL	00350019106848	Grey	No	
004	0083_QC103	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023726	Purple	No	
004	0083_QC103	Clear Plastic Bottle - Natural	250 mL	00070719042905	Green	No	
004	0083_QC103	HDPE (no PTFE)	20 mL	00350019106820	Grey	No	
004	0083_QC103	HDPE (no PTFE)	20 mL	00350019106684	Grey	No	
005	0083_MW134	Clear Plastic Bottle - Natural	250 mL	00070719042899	Green	No	
005	0083_MW134	HDPE (no PTFE)	20 mL	00350019106846	Grey	No	
005	0083_MW134	HDPE (no PTFE)	20 mL	00350019106659	Grey	No	
005	0083_MW134	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023324	Purple	No	
006	0083_QC105	Clear Plastic Bottle - Natural	250 mL	00070719042777	Green	No	
006	0083_QC105	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023462	Purple	No	
006	0083_QC105	HDPE (no PTFE)	20 mL	00352005016163	Grey	No	
006	0083_QC105	HDPE (no PTFE)	20 mL	00352005016120	Grey	No	
007	0083_OTH113	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023473	Purple	No	
007	0083_OTH113	Clear Plastic Bottle - Natural	250 mL	00070719042908	Green	No	

CHAIN OF CUSTODY

ALS COC#: 16098 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0083_OTH113	HDPE (no PTFE)	20 mL	00350019106632	Grey	No	
007	0083_OTH113	HDPE (no PTFE)	20 mL	00350019106905	Grey	No	
008	0083_MW218	Clear Plastic Bottle - Natural	250 mL	00070719042500	Green	No	
008	0083_MW218	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023376	Purple	No	
008	0083_MW218	HDPE (no PTFE)	20 mL	00352005016107	Grey	No	
008	0083_MW218	HDPE (no PTFE)	20 mL	00352005016313	Grey	No	

Total Bottle Count: ALS: 32, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012743**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020 10:50
Order number	: DEF19009/0083	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16098	Issue Date	: 01-Dec-2020 17:48
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 8		
No. of samples analysed	: 8		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- ED037-P (Alkalinity): Sample EP2012743- 6 was centrifuged before analysis to reduce possible interference from sediment which may consume the alkalinity titrant.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_MW129_201117	0083_QC102_201117	0083_MW130_201117	0083_QC103_201117	0083_MW134_201117
			Sampling date / time	17-Nov-2020 14:35	17-Nov-2020 14:36	17-Nov-2020 15:06	17-Nov-2020 15:08	17-Nov-2020 15:40
Compound	CAS Number	LOR	Unit	EP2012743-001	EP2012743-002	EP2012743-003	EP2012743-004	EP2012743-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.53	7.54	7.64	7.65	7.70
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	35300	33800	33000	33700	27000
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	39700	28700	14500	10600	25800
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	260	263	285	288	176
Total Alkalinity as CaCO3	----	1	mg/L	260	263	285	288	176
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2250	2410	2480	2300	1980
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	19400	19600	19000	19000	15600
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	468	484	440	431	428
Magnesium	7439-95-4	1	mg/L	1270	1320	1360	1330	1000
Sodium	7440-23-5	1	mg/L	9690	10100	10000	9810	8450
Potassium	7440-09-7	1	mg/L	513	535	553	538	469
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	599	608	593	590	485
ø Total Cations	----	0.01	meq/L	562	586	583	571	483
ø Ionic Balance	----	0.01	%	3.17	1.89	0.87	1.56	0.16
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	14	21	6	2	5
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW129_201117	0083_QC102_201117	0083_MW130_201117	0083_QC103_201117	0083_MW134_201117
				Sampling date / time	17-Nov-2020 14:35	17-Nov-2020 14:36	17-Nov-2020 15:06	17-Nov-2020 15:08	17-Nov-2020 15:40
					EP2012743-001	EP2012743-002	EP2012743-003	EP2012743-004	EP2012743-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW129_201117	0083_QC102_201117	0083_MW130_201117	0083_QC103_201117	0083_MW134_201117
				Sampling date / time	17-Nov-2020 14:35	17-Nov-2020 14:36	17-Nov-2020 15:06	17-Nov-2020 15:08	17-Nov-2020 15:40
					EP2012743-001	EP2012743-002	EP2012743-003	EP2012743-004	EP2012743-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**106**	**112**	**116**	**104**	**104**
13C8-PFOA	----	0.02	%		**118**	**118**	**118**	**120**	**118**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_QC105_201117	0083_OTH113_201117	0083_MW218_201117	----	----
				Sampling date / time	17-Nov-2020 15:43	17-Nov-2020 16:18	17-Nov-2020 17:01	----	----
Compound	CAS Number	LOR	Unit		EP2012743-006	EP2012743-007	EP2012743-008	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.68	8.20	7.93	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		27100	37400	16200	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		23900	33	112	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		209	111	190	----	----
Total Alkalinity as CaCO3	----	1	mg/L		209	111	190	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1930	2720	1060	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		14600	20000	8720	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		432	457	237	----	----
Magnesium	7439-95-4	1	mg/L		1010	1480	614	----	----
Sodium	7440-23-5	1	mg/L		8490	11400	4420	----	----
Potassium	7440-09-7	1	mg/L		471	631	249	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		456	623	272	----	----
ø Total Cations	----	0.01	meq/L		486	657	261	----	----
ø Ionic Balance	----	0.01	%		3.16	2.62	2.04	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	1	<1	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		16	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_QC105_201117	0083_OTH113_201117	0083_MW218_201117	----	----
				Sampling date / time	17-Nov-2020 15:43	17-Nov-2020 16:18	17-Nov-2020 17:01	----	----
Compound	CAS Number	LOR	Unit		EP2012743-006	EP2012743-007	EP2012743-008	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_QC105_201117	0083_OTH113_201117	0083_MW218_201117	----	----
				Sampling date / time	17-Nov-2020 15:43	17-Nov-2020 16:18	17-Nov-2020 17:01	----	----
Compound	CAS Number	LOR	Unit		EP2012743-006	EP2012743-007	EP2012743-008	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**113**	**109**	**108**	----	----
13C8-PFOA	----	0.02	%		**119**	**117**	**117**	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012743**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16098	Issue Date	: 01-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 8		
No. of samples analysed	: 8		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3388980)									
EP2012739-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.09	8.12	0.370	0% - 20%
EP2012742-005	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.05	8.04	0.124	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3388982)									
EP2012743-007	0083_OTH113_201117	EA005-P: pH Value	----	0.01	pH Unit	8.20	8.29	1.09	0% - 20%
EP2012792-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.38	8.39	0.119	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3380156)									
EP2012743-001	0083_MW129_201117	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	35300	34800	1.20	0% - 20%
EP2012779-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	252	253	0.595	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3380157)									
EP2012743-001	0083_MW129_201117	EA025H: Suspended Solids (SS)	----	5	mg/L	39700	42900	7.92	0% - 20%
EP2012941-003	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3388979)									
EP2012739-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	556	553	0.653	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	556	553	0.653	0% - 20%
EP2012742-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	116	119	2.54	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	116	119	2.54	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3388981)									
EP2012743-007	0083_OTH113_201117	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	111	113	1.56	0% - 20%

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3388981) - continued									
EP2012743-007	0083_OTH113_201117	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	111	113	1.56	0% - 20%
EP2012792-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	6	6	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	165	167	1.25	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	171	173	1.14	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373838)									
EP2012743-001	0083_MW129_201117	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2250	2400	6.46	0% - 20%
EP2012749-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1370	1210	12.8	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373839)									
EP2012743-001	0083_MW129_201117	ED045G: Chloride	16887-00-6	1	mg/L	19400	19700	1.53	0% - 20%
EP2012749-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	11500	11800	2.68	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3375166)									
EP2012743-001	0083_MW129_201117	ED093F: Calcium	7440-70-2	1	mg/L	468	504	7.38	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1270	1370	7.45	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	9690	10500	8.19	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	513	557	8.20	0% - 20%
EP2012749-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	290	297	2.60	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	808	830	2.59	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	6000	6210	3.41	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	330	339	2.57	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3384091)									
EP2012742-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2012749-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	1	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3376202)									
EP2012742-007	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP2012884-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3386226)									
EP2012743-001	0083_MW129_201117	EP005: Total Organic Carbon	----	1	mg/L	14	14	0.00	No Limit
EP2012911-008	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	18	19	0.00	0% - 50%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3388980)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3388982)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3380156)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	97.4	88.1	114
				<10	1000 mg/L	99.0	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3380157)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	94.0	89.1	120
				<5	1000 mg/L	97.6	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3388979)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	111	81.2	126
				<1	200 mg/L	98.2	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3388981)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	111	81.2	126
				<1	200 mg/L	97.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373838)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373839)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	87.9	114
				<1	1000 mg/L	106	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3375166)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	94.3	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	95.9	88.0	110

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
ED093F: Dissolved Major Cations (QCLot: 3375166) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	92.9	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	91.3	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	104	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3376202)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	108	87.2	116
				<1	100 mg/L	105	87.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3386226)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	106	87.2	116
				<1	100 mg/L	102	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3382762)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	80.0	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	92.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	88.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	86.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	93.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	88.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3382762)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	86.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	93.2	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	96.0	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	88.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	88.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	98.8	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.0	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	92.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3382762)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	95.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	82.2	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	83.7	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	103	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	116	57.6	145

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3382762) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	90.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	86.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3382762)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	93.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	98.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	108	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	88.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373838)							
EP2012743-001	0083_MW129_201117	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373839)							
EP2012743-001	0083_MW129_201117	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)							
EP2012742-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3376202)							
EP2012742-008	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3386226)							
EP2012911-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012743**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 01-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 8
Order number	: DEF19009/0083	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012743--001	0083_MW129_201117	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2012743--001	0083_MW129_201117	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW129_201117,	0083_QC102_201117,	----	----	----	27-Nov-2020	17-Nov-2020	**10**
0083_MW130_201117,	0083_QC103_201117,						
0083_MW134_201117,	0083_QC105_201117,						
0083_OTH113_201117,	0083_MW218_201117						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	18	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	18	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	17-Nov-2020	×
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	01-Dec-2020	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	24-Nov-2020	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_OTH113_201117,	0083_MW218_201117	**17-Nov-2020**	**----**	----	----	**25-Nov-2020**	15-Dec-2020	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0083_MW130_201117,	0083_QC103_201117,	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	15-Dec-2020	✓
0083_MW134_201117,	0083_QC105_201117							
Amber TOC Vial - Sulfuric Acid (EP005)								
0083_MW129_201117,	0083_QC102_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_MW129_201117,	0083_QC102_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0083_MW130_201117,	0083_QC103_201117,							
0083_MW134_201117,	0083_QC105_201117,							
0083_OTH113_201117,	0083_MW218_201117							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	18	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	17	**11.76**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	17	**11.76**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	17	**5.88**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	18	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012744**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16099	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 19-Nov-2020 10:50	Issue Date	: 19-Nov-2020
Client Requested Due Date	: 30-Nov-2020	Scheduled Reporting Date	: **30-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 8.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2012744-001	17-Nov-2020 16:33	0083_SD126_201117	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DAVID JAMES		
- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALSCompass SAMPLING Intelligence

ALS

Environmental Division
Perth
Work Order Reference
EP2012744

Telephone : +61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEP19009 **Client:** CARBONO **Project Manager:** M. Bourdais
Phone: ( )

ALS Compass COC Reference: 16029 **# Samples:** **Sampler:** S. McCulloch
16099, 16098 **Phone:** ( )

Turnaround Requirements: (Standard) Urgent

Special Instructions:	ALS Use Only			
	Custody seal intact?	YES	NO	(N/A)
	Free ice / frozen ice bricks upon receipt?	(YES)	NO	N/A
	Random sample temperature on receipt?	8.6	°C	

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
			[illegible]
Date / Time: 18/11/20	Date / Time:	Date / Time:	Date / Time: 19-11-20 1050.

CHAIN OF CUSTODY

ALS COC#: **16099** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SED - TEMPLATE

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD126		17/11/2020 04:33 PM	Soil	ALS: 2 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: **16099** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SED - TEMPLATE

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD126	Soil Glass Jar - Unpreserved	150 mL	00260220069423	Orange	No	
001	0083_SD126	HDPE Soil Jar	200 mL	00620719042400	Grey	No	

Total Bottle Count: ALS: 2, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012744**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020 10:50
Order number	: DEF19009/0083	Date Analysis Commenced	: 23-Nov-2020
C-O-C number	: 16099	Issue Date	: 30-Nov-2020 16:08
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD126_201117	----	----	----	----
			Sampling date / time	17-Nov-2020 16:33	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2012744-001	--------	--------	--------	--------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**9.4**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**12400**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**0.4**	----	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**61.2**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**3.6**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.1**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.5**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**65.5**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**0.7**	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**2.0**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD126_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 16:33	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012744-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD126_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 16:33	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012744-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**95.0**	----	----	----	----
13C8-PFOA	----	0.0002	%		**96.5**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012744**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 23-Nov-2020
C-O-C number	: 16099	Issue Date	: 30-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3381257)									
EP2012741-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.3	9.6	2.86	0% - 20%
EP2012893-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.5	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381256)									
EP2012741-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	26400	26600	0.755	0% - 20%
EP2012893-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	166	166	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381260)									
EP2012741-001	Anonymous	EA055: Moisture Content	----	0.1	%	9.3	7.9	16.1	0% - 20%
EP2013001-006	Anonymous	EA055: Moisture Content	----	0.1	%	3.1	3.2	4.08	No Limit
ED008: Exchangeable Cations (QC Lot: 3385244)									
EP2012741-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.4	1.3	7.27	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	54.7	54.9	0.367	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	6.1	7.1	15.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	61.8	63.0	1.86	0% - 20%
EP2012895-004	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.9	0.8	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.3	21.6	3.14	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.7	3.4	6.70	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	26.8	25.8	3.70	0% - 20%
EP004: Organic Matter (QC Lot: 3381247)									
EP2012741-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.8	1.7	7.19	No Limit
EP2013001-007	Anonymous	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3378743)									
EP2012741-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES2041170-012	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0007	0.0006	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3378743)									
EP2012741-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES2041170-012	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0002	0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0006	0.0006	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3378743)									
EP2012741-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3378743) - continued									
EP2012741-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES2041170-012	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3378743)									
EP2012741-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES2041170-012	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3381257)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	102	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3381256)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED008: Exchangeable Cations (QCLot: 3385244)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	95.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	119	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	96.4	79.9	110
EP004: Organic Matter (QCLot: 3381247)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	92.2	70.0	120
				<0.5	85 %	91.6	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3378743)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.6	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3378743)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	93.5	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.6	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.4	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.0	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.4	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.0	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3378743)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3378743) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	101	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	85.9	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	103	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.2	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3378743)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	84.0	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	92.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.4	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	96.0	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3378743)							
EP2012741-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	81.2	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	92.0	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	106	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	112	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	82.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	118	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3378743)							
EP2012741-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	87.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	84.4	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	87.6	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	90.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	95.2	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	88.8	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	93.6	69.0	133

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3378743) - continued							
EP2012741-001	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	93.2	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	95.2	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	87.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	93.9	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3378743)							
EP2012741-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	87.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	94.6	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	88.3	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	93.1	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	84.8	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	92.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	85.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3378743)							
EP2012741-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	92.4	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	92.0	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	108	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012744**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 30-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 1
Order number	: DEF19009/0083	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
0083_SD126_201117	25-Nov-2020	24-Nov-2020	1	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
0083_SD126_201117	25-Nov-2020	24-Nov-2020	1	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
0083_SD126_201117	**17-Nov-2020**	**25-Nov-2020**	24-Nov-2020	×	**25-Nov-2020**	25-Nov-2020	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
0083_SD126_201117	**17-Nov-2020**	**25-Nov-2020**	24-Nov-2020	×	**25-Nov-2020**	23-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
0083_SD126_201117	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	01-Dec-2020	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
0083_SD126_201117	**17-Nov-2020**	**27-Nov-2020**	15-Dec-2020	✓	**27-Nov-2020**	15-Dec-2020	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0083_SD126_201117	**17-Nov-2020**	**27-Nov-2020**	15-Dec-2020	✓	**27-Nov-2020**	15-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD126_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0083_SD126_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0083_SD126_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD126_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0083_SD126_201117	**17-Nov-2020**	**23-Nov-2020**	16-May-2021	✓	**24-Nov-2020**	02-Jan-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012748**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16030	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 19-Nov-2020 10:50	Issue Date	: 19-Nov-2020
Client Requested Due Date	: 30-Nov-2020	Scheduled Reporting Date	: **30-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 8.6 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 5 / 5

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP231X PFAS - Full Suite (28 analytes)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012748-001	17-Nov-2020 10:23	0082_MW135_201117	✓	✓	✓	✓	✓	✓	✓
EP2012748-002	17-Nov-2020 10:59	0082_MW134_201117	✓	✓	✓	✓	✓	✓	✓
EP2012748-003	17-Nov-2020 11:00	0082_QC105_201117	✓	✓	✓	✓	✓	✓	✓
EP2012748-004	17-Nov-2020 11:26	0082_MW147_201117	✓	✓	✓	✓	✓	✓	✓
EP2012748-005	17-Nov-2020 11:51	0082_MW148S_201117	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - EP005 Total Organic Carbon (TOC)
EP2012748-001	17-Nov-2020 10:23	0082_MW135_201117		✓
EP2012748-002	17-Nov-2020 10:59	0082_MW134_201117		✓
EP2012748-003	17-Nov-2020 11:00	0082_QC105_201117		✓
EP2012748-004	17-Nov-2020 11:26	0082_MW147_201117	✓	
EP2012748-005	17-Nov-2020 11:51	0082_MW148S_201117	✓	

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0082_MW134_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW135_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW147_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW148S_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_QC105_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DAVID JAMES		
- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

Environmental Division
Perth
Work Order Reference
EP2012748

Telephone : +61-8-9406 1301

ALSCompass SAMPLING Intelligence

Custody Document for Submissions via ALS Compass App

Project: DEM19009 **Client:** CITRONO **Project Manager:** M. Bowdeis
Phone: ( )

ALS Compass COC Reference: 16029 **# Samples:** **Sampler:** S. McCulloch
Phone: ( )

16099, 16098

Turnaround Requirements: (Standard) Urgent

Special Instructions:	ALS Use Only			
	Custody seal intact?	YES	NO	(N/A)
	Free ice / frozen ice bricks upon receipt?	(YES)	NO	N/A
	Random sample temperature on receipt?	8.6 °C		

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
			RMoore
Date / Time:	**Date / Time:**	**Date / Time:**	**Date / Time:**
18/11/20			19-11-20 1050

CHAIN OF CUSTODY

ALS COC#: **16030** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHB GW - TEMPLATE

ORDER NO: DEF19009/0082

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
~~001~~	~~0082_MW135~~		~~17/11/2020 10:23 AM~~	~~Water~~	~~ALS: 4 Non ALS: 0~~	No	X		
002	0082_MW134		17/11/2020 10:59 AM	Water	ALS: 6 Non ALS: 0	No	X		
003	0082_QC105		17/11/2020 11:00 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0082_MW147		17/11/2020 11:26 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0082_MW148S		17/11/2020 11:51 AM	Water	ALS: 4 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: 16030 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHB GW - TEMPLATE

ORDER NO: DEF19009/0082

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0082_MW135	Clear Plastic Bottle - Natural	250 mL	00070719042940	Green	No	
001	0082_MW135	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023734	Purple	No	
001	0082_MW135	HDPE (no PTFE)	20 mL	00350019106801	Grey	No	
001	0082_MW135	HDPE (no PTFE)	20 mL	00350019106853	Grey	No	
002	0082_MW134	Clear Plastic Bottle - Natural	250 mL	00070719042261	Green	No	
002	0082_MW134	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023776	Purple	No	
002	0082_MW134	HDPE (no PTFE)	20 mL	00350019106760	Grey	No	
002	0082_MW134	HDPE (no PTFE)	20 mL	00352005007019	Grey	No	
002	0082_MW134	HDPE (no PTFE)	20 mL	00352005007043	Grey	No	
002	0082_MW134	HDPE (no PTFE)	20 mL	00350019106773	Grey	No	
003	0082_QC105	Clear Plastic Bottle - Natural	250 mL	00070719042011	Green	No	
003	0082_QC105	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023719	Purple	No	
003	0082_QC105	HDPE (no PTFE)	20 mL	00350019106785	Grey	No	
003	0082_QC105	HDPE (no PTFE)	20 mL	00350019106866	Grey	No	
004	0082_MW147	Clear Plastic Bottle - Natural	250 mL	00070719042085	Green	No	
004	0082_MW147	HDPE (no PTFE)	20 mL	00350019106774	Grey	No	
004	0082_MW147	HDPE (no PTFE)	20 mL	00350019106710	Grey	No	
004	0082_MW147	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023285	Purple	No	
005	0082_MW148S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023705	Purple	No	
005	0082_MW148S	Clear Plastic Bottle - Natural	250 mL	00070719042955	Green	No	
005	0082_MW148S	HDPE (no PTFE)	20 mL	00350019106706	Grey	No	
005	0082_MW148S	HDPE (no PTFE)	20 mL	00350019106741	Grey	No	

Total Bottle Count: ALS: 22, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012748**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020 10:50
Order number	: DEF19009/0082	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16030	Issue Date	: 30-Nov-2020 17:44
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		

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Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP005 (Total Organic Carbon): LOR raised for samples EP2012748-001 and 003 due to possible sample matrix interference.
- ED037-P (Alkalinity): Sample EP2012748-1 was centrifuged before analysis to reduce possible interference from sediment which may consume the alkalinity titrant.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0082_MW135_201117	0082_MW134_201117	0082_QC105_201117	0082_MW147_201117	0082_MW148S_201117
			Sampling date / time	17-Nov-2020 10:23	17-Nov-2020 10:59	17-Nov-2020 11:00	17-Nov-2020 11:26	17-Nov-2020 11:51
Compound	CAS Number	LOR	Unit	EP2012748-001	EP2012748-002	EP2012748-003	EP2012748-004	EP2012748-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.94	7.57	7.59	7.54	7.61
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	14800	29300	28400	24500	29100
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	74900	15500	16100	2720	2280
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	623	303	329	290	295
Total Alkalinity as CaCO3	----	1	mg/L	623	303	329	290	295
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2580	1860	1880	1690	2100
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	7720	15300	15100	13200	15400
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	142	572	572	528	578
Magnesium	7439-95-4	1	mg/L	415	989	983	894	1000
Sodium	7440-23-5	1	mg/L	5310	8550	8470	7210	8520
Potassium	7440-09-7	1	mg/L	223	368	362	338	392
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	284	476	472	413	484
ø Total Cations	----	0.01	meq/L	278	491	487	422	492
ø Ionic Balance	----	0.01	%	1.07	1.54	1.61	1.06	0.79
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	----	----	2	1
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	<10	4	<2	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_MW135_201117	0082_MW134_201117	0082_QC105_201117	0082_MW147_201117	0082_MW148S_201117
				Sampling date / time	17-Nov-2020 10:23	17-Nov-2020 10:59	17-Nov-2020 11:00	17-Nov-2020 11:26	17-Nov-2020 11:51
					EP2012748-001	EP2012748-002	EP2012748-003	EP2012748-004	EP2012748-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW135_201117	0082_MW134_201117	0082_QC105_201117	0082_MW147_201117	0082_MW148S_201117
				Sampling date / time	17-Nov-2020 10:23	17-Nov-2020 10:59	17-Nov-2020 11:00	17-Nov-2020 11:26	17-Nov-2020 11:51
Compound	CAS Number	LOR	Unit		EP2012748-001	EP2012748-002	EP2012748-003	EP2012748-004	EP2012748-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**103**	**97.2**	**107**	**101**	**98.5**
13C8-PFOA	----	0.02	%		**106**	**105**	**111**	**113**	**103**

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012748**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Order number	: DEF19009/0082	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16030	Issue Date	: 30-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		

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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3388982)									
EP2012743-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.20	8.29	1.09	0% - 20%
EP2012792-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.38	8.39	0.119	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3380138)									
EP2012738-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	34100	33800	0.942	0% - 20%
EP2012738-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	941	932	0.907	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3380139)									
EP2012738-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	432	453	4.81	0% - 20%
EP2012739-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1900	1890	0.343	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3388981)									
EP2012743-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	111	113	1.56	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	111	113	1.56	0% - 20%
EP2012792-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	6	6	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	165	167	1.25	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	171	173	1.14	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373829)									
EP2012739-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	147	147	0.00	0% - 20%
EP2012742-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2790	2770	0.794	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373830)									
EP2012739-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	508	509	0.252	0% - 20%
EP2012742-004	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19800	19800	0.242	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3375141)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 3375141) - continued									
EP2012742-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	496	498	0.380	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1540	1550	0.0744	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11900	11900	0.582	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	649	662	2.01	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3384091)									
EP2012742-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2012749-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	1	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3376202)									
EP2012742-007	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP2012884-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3385762)									
EP2012742-002	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3385762)									
EP2012742-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3385762)									
EP2012742-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3385762) - continued									
EP2012742-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3385762)									
EP2012742-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3385762)									
EP2012742-002	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3388982)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3380138)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	97.2	88.1	114
				<10	1000 mg/L	98.2	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3380139)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	108	89.1	120
				<5	1000 mg/L	97.6	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3388981)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	111	81.2	126
				<1	200 mg/L	97.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373829)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	97.6	87.7	113
				<1	500 mg/L	105	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373830)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	93.0	87.9	114
				<1	1000 mg/L	103	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3375141)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.5	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.9	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.7	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	104	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3376202)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	108	87.2	116
				<1	100 mg/L	105	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3385762)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	84.4	72.0	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3385762) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	94.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	87.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	89.2	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	94.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3385762)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	87.9	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	98.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	101	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	99.0	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	95.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	98.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	88.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	92.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3385762)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	92.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	109	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	104	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	110	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	98.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	94.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	88.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3385762)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	88.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	96.2	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	91.4	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373829)							
EP2012739-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	103	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373830)							
EP2012739-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	100	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)							
EP2012742-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3376202)							
EP2012742-008	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3385762)							
EP2012748-002	0082_MW134_201117	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	92.2	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	100	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	92.4	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	91.4	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	94.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	94.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3385762)							
EP2012748-002	0082_MW134_201117	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	92.5	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	101	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	102	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	108	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	106	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	95.6	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	96.4	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	107	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	120	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	99.4	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	87.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3385762)							
EP2012748-002	0082_MW134_201117	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	89.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	108	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	108	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	112	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	102	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.2	65.0	136

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3385762) - continued							
EP2012748-002	0082_MW134_201117	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	91.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3385762)							
EP2012748-002	0082_MW134_201117	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	92.4	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	112	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	113	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	111	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012748**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Site	: DEF19009/HEHB	Issue Date	: 30-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 5
Order number	: DEF19009/0082	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	----	----	----	27-Nov-2020	17-Nov-2020	**10**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	19	5.26	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	17-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	01-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	24-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**----**	----	----	**25-Nov-2020**	15-Dec-2020	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	15-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW135_201117, 0082_MW134_201117, 0082_QC105_201117, 0082_MW147_201117, 0082_MW148S_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012749**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16093	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 19-Nov-2020 10:50	Issue Date	: 19-Nov-2020
Client Requested Due Date	: 30-Nov-2020	Scheduled Reporting Date	: **30-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 8.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 8 / 8

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012749-001	17-Nov-2020 14:29	0083_MW008_201117	✓	✓	✓	✓	✓	✓	✓
EP2012749-002	17-Nov-2020 14:44	0083_MW003_201117	✓	✓	✓	✓	✓	✓	✓
EP2012749-003	17-Nov-2020 15:12	0083_MW212_201117	✓	✓	✓	✓	✓	✓	✓
EP2012749-004	17-Nov-2020 15:14	0083_QC104_201117	✓	✓	✓	✓	✓	✓	✓
EP2012749-005	17-Nov-2020 16:03	0083_MW105_201117	✓	✓	✓	✓	✓	✓	✓
EP2012749-006	17-Nov-2020 16:04	0083_QC106_201117	✓	✓	✓	✓	✓	✓	✓
EP2012749-007	17-Nov-2020 16:27	0083_MW210_201117	✓	✓	✓	✓	✓	✓	✓
EP2012749-008	17-Nov-2020 16:50	0083_MW119_201117	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012749-001	17-Nov-2020 14:29	0083_MW008_201117	✓
EP2012749-002	17-Nov-2020 14:44	0083_MW003_201117	✓
EP2012749-003	17-Nov-2020 15:12	0083_MW212_201117	✓
EP2012749-004	17-Nov-2020 15:14	0083_QC104_201117	✓
EP2012749-005	17-Nov-2020 16:03	0083_MW105_201117	✓
EP2012749-006	17-Nov-2020 16:04	0083_QC106_201117	✓
EP2012749-007	17-Nov-2020 16:27	0083_MW210_201117	✓
EP2012749-008	17-Nov-2020 16:50	0083_MW119_201117	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							

0083_MW003_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW008_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW105_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW119_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW210_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_MW212_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_QC104_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0083_QC106_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALSCompass SAMPLING *Intelligence*

Environmental Division
Perth
Work Order Reference
EP2012749

Telephone : +61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEP19009 **Client:** CITRONO **Project Manager:** M. Bowden
Phone: ( )

ALS Compass COC Reference: 4029 **# Samples:** **Sampler:** S. McCulloch
16099, 16098 **Phone:** ( )

Turnaround Requirements: Standard Urgent

Special Instructions:	ALS Use Only			
	Custody seal intact?	YES	NO	N/A
	Free ice / frozen ice bricks upon receipt?	YES	NO	N/A
	Random sample temperature on receipt?	8.6 °C		

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
Date / Time: 18/11/20	Date / Time:	Date / Time:	Date / Time: 19-11-20 1050

CHAIN OF CUSTODY

ALS COC#: **16093** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
~~001~~	~~0083_MW008~~		~~17/11/2020 02:29 PM~~	~~Water~~	~~ALS: 4 Non ALS: 0~~	~~No~~	X		
002	0083_MW003		17/11/2020 02:44 PM	Water	ALS: 4 Non ALS: 0	No	X		
003	0083_MW212		17/11/2020 03:12 PM	Water	ALS: 4 Non ALS: 0	No	X		
004	0083_QC104		17/11/2020 03:14 PM	Water	ALS: 4 Non ALS: 0	No	X		
005	0083_MW105		17/11/2020 04:03 PM	Water	ALS: 6 Non ALS: 0	No	X		
006	0083_QC106		17/11/2020 04:04 PM	Water	ALS: 4 Non ALS: 0	No	X		
007	0083_MW210		17/11/2020 04:27 PM	Water	ALS: 4 Non ALS: 0	No	X		
008	0083_MW119		17/11/2020 04:50 PM	Water	ALS: 4 Non ALS: 0	No	X		

CHAIN OF CUSTODY

(ALS) COC#: **16093** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW008	Clear Plastic Bottle - Natural	250 mL	00070719042263	Green	No	
001	0083_MW008	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023736	Purple	No	
001	0083_MW008	HDPE (no PTFE)	20 mL	00350019106917	Grey	No	
001	0083_MW008	HDPE (no PTFE)	20 mL	00350019106738	Grey	No	
002	0083_MW003	Clear Plastic Bottle - Natural	250 mL	00070719042017	Green	No	
002	0083_MW003	HDPE (no PTFE)	20 mL	00350019106779	Grey	No	
002	0083_MW003	HDPE (no PTFE)	20 mL	00350019106693	Grey	No	
002	0083_MW003	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023404	Purple	No	
003	0083_MW212	Clear Plastic Bottle - Natural	250 mL	00070719042241	Green	No	
003	0083_MW212	HDPE (no PTFE)	20 mL	00350019106826	Grey	No	
003	0083_MW212	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023379	Purple	No	
003	0083_MW212	HDPE (no PTFE)	20 mL	00350019106876	Grey	No	
004	0083_QC104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023290	Purple	No	
004	0083_QC104	HDPE (no PTFE)	20 mL	00350019106748	Grey	No	
004	0083_QC104	HDPE (no PTFE)	20 mL	00350019106879	Grey	No	
004	0083_QC104	Clear Plastic Bottle - Natural	250 mL	00070719042792	Green	No	
005	0083_MW105	Clear Plastic Bottle - Natural	250 mL	00070719042242	Green	No	
005	0083_MW105	HDPE (no PTFE)	20 mL	00352005006992	Grey	No	
005	0083_MW105	HDPE (no PTFE)	20 mL	00350019106762	Grey	No	
005	0083_MW105	HDPE (no PTFE)	20 mL	00350019106712	Grey	No	
005	0083_MW105	HDPE (no PTFE)	20 mL	00352005006961	Grey	No	
005	0083_MW105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023436	Purple	No	
006	0083_QC106	Clear Plastic Bottle - Natural	250 mL	00070719042886	Green	No	
006	0083_QC106	HDPE (no PTFE)	20 mL	00350019106838	Grey	No	
006	0083_QC106	HDPE (no PTFE)	20 mL	00350019106870	Grey	No	
006	0083_QC106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023643	Purple	No	

CHAIN OF CUSTODY

ALS COC#: **16093** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0083_MW210	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023730	Purple	No	
007	0083_MW210	Clear Plastic Bottle - Natural	250 mL	00070719042880	Green	No	
007	0083_MW210	HDPE (no PTFE)	20 mL	00350019106794	Grey	No	
007	0083_MW210	HDPE (no PTFE)	20 mL	00350019106839	Grey	No	
008	0083_MW119	Clear Plastic Bottle - Natural	250 mL	00070719042925	Green	No	
008	0083_MW119	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023335	Purple	No	
008	0083_MW119	HDPE (no PTFE)	20 mL	00350019106739	Grey	No	
008	0083_MW119	HDPE (no PTFE)	20 mL	00350019106791	Grey	No	

Total Bottle Count: ALS: 34, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012749**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020 10:50
Order number	: DEF19009/0083	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16093	Issue Date	: 30-Nov-2020 15:57
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 8		
No. of samples analysed	: 8		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EA025H: Samples #3 and #4 had slightly different amounts of sediment within the bottle and as such this may affect the result for suspended solids. Please scrutinize accordingly.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_MW008_201117	0083_MW003_201117	0083_MW212_201117	0083_QC104_201117	0083_MW105_201117
			Sampling date / time	17-Nov-2020 14:29	17-Nov-2020 14:44	17-Nov-2020 15:12	17-Nov-2020 15:14	17-Nov-2020 16:03
Compound	CAS Number	LOR	Unit	EP2012749-001	EP2012749-002	EP2012749-003	EP2012749-004	EP2012749-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.77	7.81	7.78	7.79	7.72
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	19700	11100	20600	20100	20300
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	328	204	130	86	10200
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	226	294	214	212	269
Total Alkalinity as CaCO3	----	1	mg/L	226	294	214	212	269
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1300	701	1370	1350	1320
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	9860	6360	11500	11800	10800
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	269	233	290	269	287
Magnesium	7439-95-4	1	mg/L	732	415	808	758	771
Sodium	7440-23-5	1	mg/L	5250	3020	6000	5610	5500
Potassium	7440-09-7	1	mg/L	282	167	330	310	305
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	310	200	357	365	338
ø Total Cations	----	0.01	meq/L	309	181	350	328	325
ø Ionic Balance	----	0.01	%	0.08	4.84	0.96	5.40	1.92
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	12	2	<1	2
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.03	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.77	<0.02	<0.02	0.09
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.04	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW008_201117	0083_MW003_201117	0083_MW212_201117	0083_QC104_201117	0083_MW105_201117
				Sampling date / time	17-Nov-2020 14:29	17-Nov-2020 14:44	17-Nov-2020 15:12	17-Nov-2020 15:14	17-Nov-2020 16:03
Compound	CAS Number	LOR	Unit		EP2012749-001	EP2012749-002	EP2012749-003	EP2012749-004	EP2012749-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.40**	**15.3**	<0.01	<0.01	**0.22**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**0.51**	<0.02	<0.02	**0.12**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	**0.61**	<0.02	<0.02	**0.17**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.22**	<0.02	<0.02	**0.06**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.18**	<0.01	<0.01	**0.03**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	**0.03**	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	**0.02**	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW008_201117	0083_MW003_201117	0083_MW212_201117	0083_QC104_201117	0083_MW105_201117
				Sampling date / time	17-Nov-2020 14:29	17-Nov-2020 14:44	17-Nov-2020 15:12	17-Nov-2020 15:14	17-Nov-2020 16:03
Compound	CAS Number	LOR	Unit		EP2012749-001	EP2012749-002	EP2012749-003	EP2012749-004	EP2012749-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	**0.42**	<0.05	<0.05	**0.58**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	**0.17**	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.40**	**18.3**	<0.01	<0.01	**1.27**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.40**	**16.1**	<0.01	<0.01	**0.31**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.40**	**18.2**	<0.01	<0.01	**1.27**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**107**	**111**	**112**	**115**	**110**
13C8-PFOA	----	0.02	%		**114**	**119**	**112**	**111**	**115**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_QC106_201117	0083_MW210_201117	0083_MW119_201117	----	----
			Sampling date / time	17-Nov-2020 16:04	17-Nov-2020 16:27	17-Nov-2020 16:50	----	----
Compound	CAS Number	LOR	Unit	EP2012749-006	EP2012749-007	EP2012749-008	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.80	7.78	7.84	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	18500	16800	15200	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	1240	68	102	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	315	259	266	----	----
Total Alkalinity as CaCO3	----	1	mg/L	315	259	266	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1350	1080	890	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	10900	8540	8370	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	292	263	203	----	----
Magnesium	7439-95-4	1	mg/L	773	642	551	----	----
Sodium	7440-23-5	1	mg/L	5700	4550	4150	----	----
Potassium	7440-09-7	1	mg/L	317	254	252	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	342	268	260	----	----
ø Total Cations	----	0.01	meq/L	334	270	242	----	----
ø Ionic Balance	----	0.01	%	1.13	0.34	3.49	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	7	3	6	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.02	<0.02	0.95	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	1.82	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.12	<0.02	8.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.09	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_QC106_201117	0083_MW210_201117	0083_MW119_201117	----	----
				Sampling date / time	17-Nov-2020 16:04	17-Nov-2020 16:27	17-Nov-2020 16:50	----	----
Compound	CAS Number	LOR	Unit		EP2012749-006	EP2012749-007	EP2012749-008	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.20**	<0.01	**0.10**	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	**0.4**	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.20**	<0.02	**1.21**	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.26**	<0.02	**3.96**	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.11**	<0.02	**0.24**	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.04**	<0.01	**0.14**	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_QC106_201117	0083_MW210_201117	0083_MW119_201117	----	----
				Sampling date / time	17-Nov-2020 16:04	17-Nov-2020 16:27	17-Nov-2020 16:50	----	----
Compound	CAS Number	LOR	Unit		EP2012749-006	EP2012749-007	EP2012749-008	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**0.55**	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**1.50**	<0.01	**16.9**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.32**	<0.01	**8.12**	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**1.50**	<0.01	**15.0**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**106**	**108**	**112**	----	----
13C8-PFOA	----	0.02	%		**117**	**117**	**118**	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012749**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16093	Issue Date	: 30-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 8		
No. of samples analysed	: 8		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3386341)									
EP2012749-002	0083_MW003_201117	EA005-P: pH Value	----	0.01	pH Unit	7.81	7.81	0.00	0% - 20%
EP2012769-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.01	8.04	0.374	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3380140)									
EP2012739-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	803	800	0.374	0% - 20%
EP2012742-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	38100	38300	0.393	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3380141)									
EP2012739-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	154	130	16.9	0% - 20%
EP2012749-001	0083_MW008_201117	EA025H: Suspended Solids (SS)	----	5	mg/L	328	291	11.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3386340)									
EP2012749-002	0083_MW003_201117	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	294	292	0.618	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	294	292	0.618	0% - 20%
EP2012769-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	113	116	2.14	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	113	116	2.14	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373838)									
EP2012743-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2250	2400	6.46	0% - 20%
EP2012749-003	0083_MW212_201117	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1370	1210	12.8	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373839)									
EP2012743-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19400	19700	1.53	0% - 20%
EP2012749-003	0083_MW212_201117	ED045G: Chloride	16887-00-6	1	mg/L	11500	11800	2.68	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3375166)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 3375166) - continued									
EP2012743-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	468	504	7.38	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1270	1370	7.45	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	9690	10500	8.19	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	513	557	8.20	0% - 20%
EP2012749-003	0083_MW212_201117	ED093F: Calcium	7440-70-2	1	mg/L	290	297	2.60	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	808	830	2.59	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	6000	6210	3.41	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	330	339	2.57	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3384091)									
EP2012742-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2012749-003	0083_MW212_201117	EP002: Dissolved Organic Carbon	----	1	mg/L	2	1	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3386341)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3380140)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.5	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3380141)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	107	89.1	120
				<5	1000 mg/L	99.6	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3386340)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	106	81.2	126
				<1	200 mg/L	99.1	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373838)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373839)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	87.9	114
				<1	1000 mg/L	106	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3375166)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	94.3	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	95.9	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	92.9	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	91.3	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	104	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3384479)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	77.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	83.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	79.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	79.2	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3384479) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	85.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	85.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3384479)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	82.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	85.0	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	92.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	91.0	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	91.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	82.2	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	90.8	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	95.8	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	83.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	89.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3384479)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	90.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	82.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	77.9	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	84.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	91.6	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	88.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	87.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3384479)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	93.8	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	95.2	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	104	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	82.6	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373838)							
EP2012743-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373839)							
EP2012743-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3384091)							
EP2012742-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012749**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 19-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 30-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 8
Order number	: DEF19009/0083	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012743--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2012743--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW008_201117,	0083_MW003_201117,	----	----	----	26-Nov-2020	17-Nov-2020	**9**
0083_MW212_201117,	0083_QC104_201117,						
0083_MW105_201117,	0083_QC106_201117,						
0083_MW210_201117,	0083_MW119_201117						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	9	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	9	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	17-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	01-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	24-Nov-2020	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**----**	----	----	**25-Nov-2020**	15-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_MW008_201117, 0083_MW003_201117, 0083_MW212_201117, 0083_QC104_201117, 0083_MW105_201117, 0083_QC106_201117, 0083_MW210_201117, 0083_MW119_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	9	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	**5.56**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	9	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012801**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16127	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 20-Nov-2020 11:15	Issue Date	: 23-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: **03-Dec-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 4.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2012801-001	18-Nov-2020 09:09	0083_SD113_201118	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DAVID JAMES		
- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CHAIN OF CUSTODY

COC#: **16127** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	RMoore DATE TIME: 20/11/20 11:15	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA SED

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD113		18/11/2020 09:09 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012801

Telephone : + 61-8-9406 1301

CHAIN OF CUSTODY

COC#: 16127 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD113	Soil Glass Jar - Unpreserved	150 mL	00260220069426	Orange	No	
001	0083_SD113	HDPE Soil Jar	200 mL	00620719042431	Grey	No	

Total Bottle Count: ALS: 2, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012801**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020 11:15
Order number	: DEF19009/0083	Date Analysis Commenced	: 24-Nov-2020
C-O-C number	: 16127	Issue Date	: 03-Dec-2020 17:48
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X: High Matrix Spike (MS) recovery for analyte "N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE) and N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)" deemed acceptable as all associated analyte results are less than LOR.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD113_201118	----	----	----	----
			Sampling date / time	18-Nov-2020 09:09	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2012801-001	--------	--------	--------	--------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**7.6**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**391**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**4.9**	----	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**22.7**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**2.2**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.1**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.2**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**25.1**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**0.7**	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**9.7**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	**0.0004**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0012**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0073**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	**0.0032**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0020**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	**0.0009**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	**0.0009**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	**0.0004**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD113_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 09:09	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012801-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		**0.0003**	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		**0.0200**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		**0.0152**	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0518**	----	----	----	----

Analytical Results

Sub-Matrix: **SEDIMENT** (Matrix: **SOIL**)				Sample ID	0083_SD113_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 09:09	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EP2012801-001**	--------	--------	--------	--------
					Result	----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0085**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0511**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**114**	----	----	----	----
13C8-PFOA	----	0.0002	%		**120**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012801**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 24-Nov-2020
C-O-C number	: 16127	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3381257)									
EP2012741-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.3	9.6	2.86	0% - 20%
EP2012893-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.5	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381256)									
EP2012741-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	26400	26600	0.755	0% - 20%
EP2012893-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	166	166	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381261)									
EP2012801-001	0083_SD113_201118	EA055: Moisture Content	----	0.1	%	4.9	5.1	4.61	0% - 20%
EP2012895-004	Anonymous	EA055: Moisture Content	----	0.1	%	7.6	7.1	5.76	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3385244)									
EP2012741-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.4	1.3	7.27	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	54.7	54.9	0.367	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	6.1	7.1	15.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	61.8	63.0	1.86	0% - 20%
EP2012895-004	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.9	0.8	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.3	21.6	3.14	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.7	3.4	6.70	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	26.8	25.8	3.70	0% - 20%
EP004: Organic Matter (QC Lot: 3381248)									
EP2012801-001	0083_SD113_201118	EP004: Organic Matter	----	0.5	%	9.7	9.6	1.27	0% - 50%
EP2012895-005	Anonymous	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	0083_SD113_201118	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0012	0.0009	28.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0073	0.0068	6.91	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0052	0.0059	13.1	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386495)									
EP2012801-001	0083_SD113_201118	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0032	0.0036	12.8	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0020	0.0018	6.90	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0009	0.0008	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0009	0.0009	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495)									
EP2012801-001	0083_SD113_201118	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495) - continued									
EP2012801-001	0083_SD113_201118	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	0083_SD113_201118	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	0.0200	0.0219	9.20	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0152	0.0150	1.21	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3381257)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	102	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3381256)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED008: Exchangeable Cations (QCLot: 3385244)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	95.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	119	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	96.4	79.9	110
EP004: Organic Matter (QCLot: 3381248)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	103	70.0	120
				<0.5	85 %	87.3	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	92.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.8	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.7	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.4	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.9	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	104	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	65.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.6	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	90.4	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	0083_SD113_201118	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	92.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	73.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	84.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	89.2	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	71.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)							
EP2012801-001	0083_SD113_201118	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	104	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	131	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	73.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	81.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	86.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	101	72.0	129

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495) - continued							
EP2012801-001	0083_SD113_201118	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	73.6	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	90.4	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	104	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	85.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	102	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)							
EP2012801-001	0083_SD113_201118	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	71.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.8	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	105	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 219	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 207	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	78.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	77.2	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	0083_SD113_201118	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	# Not Determined	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	# Not Determined	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	97.2	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012801**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 1
Order number	: DEF19009/0083	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2012801--001	0083_SD113_201118	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	0083_SD113_201118	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	219 %	68.7-130%	**Recovery greater than upper data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	0083_SD113_201118	**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	207 %	65.1-134%	**Recovery greater than upper data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	0083_SD113_201118	**6:2 Fluorotelomer sulfonic acid (6:2 FTS)**	27619-97-2	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	0083_SD113_201118	**8:2 Fluorotelomer sulfonic acid (8:2 FTS)**	39108-34-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) 0083_SD113_201118	**18-Nov-2020**	**25-Nov-2020**	25-Nov-2020	✓	**25-Nov-2020**	25-Nov-2020	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010) 0083_SD113_201118	**18-Nov-2020**	**25-Nov-2020**	25-Nov-2020	✓	**25-Nov-2020**	23-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) 0083_SD113_201118	**18-Nov-2020**	**----**	----	----	**24-Nov-2020**	02-Dec-2020	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
0083_SD113_201118	**18-Nov-2020**	**27-Nov-2020**	16-Dec-2020	✓	**27-Nov-2020**	16-Dec-2020	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0083_SD113_201118	**18-Nov-2020**	**30-Nov-2020**	16-Dec-2020	✓	**30-Nov-2020**	16-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD113_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0083_SD113_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0083_SD113_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD113_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0083_SD113_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012802**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
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Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16130	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 20-Nov-2020 11:15	Issue Date	: 23-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: **03-Dec-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 4.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 12 / 12

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012802-001	18-Nov-2020 09:23	0083_MW019_201118	✓	✓	✓	✓	✓	✓	✓
EP2012802-002	18-Nov-2020 09:46	0083_MW027_201118	✓	✓	✓	✓	✓	✓	✓
EP2012802-003	18-Nov-2020 10:05	0083_MW103_201118	✓	✓	✓	✓	✓	✓	✓
EP2012802-004	18-Nov-2020 10:22	0083_MW102_201118	✓	✓	✓	✓	✓	✓	✓
EP2012802-005	18-Nov-2020 10:39	0083_MW101_201118	✓	✓	✓	✓		✓	✓
EP2012802-006	18-Nov-2020 10:55	0083_MW017_201118	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012802-001	18-Nov-2020 09:23	0083_MW019_201118		✓
EP2012802-002	18-Nov-2020 09:46	0083_MW027_201118		✓
EP2012802-003	18-Nov-2020 10:05	0083_MW103_201118		✓
EP2012802-004	18-Nov-2020 10:22	0083_MW102_201118		✓
EP2012802-005	18-Nov-2020 10:39	0083_MW101_201118	✓	✓
EP2012802-006	18-Nov-2020 10:55	0083_MW017_201118		✓
EP2012802-007	18-Nov-2020 15:34	0083_QC301_201118		✓
EP2012802-008	18-Nov-2020 15:35	0083_QC401_201118		✓
EP2012802-009	18-Nov-2020 15:36	0083_QC302_201118		✓
EP2012802-010	18-Nov-2020 15:38	0083_QC402_201118		✓
EP2012802-011	18-Nov-2020 15:38	0083_QC303_201118		✓
EP2012802-012	18-Nov-2020 15:39	0083_QC403_201118		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0083_MW017_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	✘	----	----
0083_MW019_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	✘	----	----
0083_MW027_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	✘	----	----
0083_MW101_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	✘	----	----
0083_MW102_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	✘	----	----
0083_MW103_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	✘	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CHAIN OF CUSTODY

ALS COC#: 16130 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: RJMoore 20/11/20 11:15	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW -

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_MW019		18/11/2020 09:23 AM	Water	ALS: 4 Non ALS: 0	No	X				
002	0083_MW027		18/11/2020 09:46 AM	Water	ALS: 4 Non ALS: 0	No	X				
003	0083_MW103		18/11/2020 10:05 AM	Water	ALS: 4 Non ALS: 0	No	X				
004	0083_MW102		18/11/2020 10:22 AM	Water	ALS: 4 Non ALS: 0	No	X				
005	0083_MW101		18/11/2020 10:39 AM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
006	0083_MW017		18/11/2020 10:55 AM	Water	ALS: 4 Non ALS: 0	No	X				
007	0083_QC301		18/11/2020 03:34 PM	Water	ALS: 2 Non ALS: 0	No		X			
008	0083_QC401		18/11/2020 03:35 PM	Water	ALS: 2 Non ALS: 0	No		X			
009	0083_QC302		18/11/2020 03:36 PM	Water	ALS: 2 Non ALS: 0	No		X			

Environmental Division Perth

Work Order Reference

EP2012802

Telephone : + 61-8-9406 1301

CHAIN OF CUSTODY

COC#: **16130** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW -

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED				
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0083_QC402		18/11/2020 03:38 PM	Water	ALS: 2 Non ALS: 0	No		X			
011	0083_QC303		18/11/2020 03:38 PM	Water	ALS: 2 Non ALS: 0	No		X			
012	0083_QC403		18/11/2020 03:39 PM	Water	ALS: 2 Non ALS: 0	No		X			

CHAIN OF CUSTODY

ALS COC#: 16130 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW -

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
005	0083_MW101	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)

CHAIN OF CUSTODY

COC#: **16130** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW -

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW019	Clear Plastic Bottle - Natural	250 mL	00070719042906	Green	No	
001	0083_MW019	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023310	Purple	No	
001	0083_MW019	HDPE (no PTFE)	20 mL	00352005016250	Grey	No	
001	0083_MW019	HDPE (no PTFE)	20 mL	00352005016215	Grey	No	
002	0083_MW027	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056662	Purple	No	
002	0083_MW027	Clear Plastic Bottle - Natural	250 mL	00070719042808	Green	No	
002	0083_MW027	HDPE (no PTFE)	20 mL	00352005016251	Grey	No	
002	0083_MW027	HDPE (no PTFE)	20 mL	00352005016137	Grey	No	
003	0083_MW103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023704	Purple	No	
003	0083_MW103	Clear Plastic Bottle - Natural	250 mL	00070719042872	Green	No	
003	0083_MW103	HDPE (no PTFE)	20 mL	00350019106780	Grey	No	
003	0083_MW103	HDPE (no PTFE)	20 mL	00350019106921	Grey	No	
004	0083_MW102	Clear Plastic Bottle - Natural	250 mL	00070719042919	Green	No	
004	0083_MW102	HDPE (no PTFE)	20 mL	00350019106816	Grey	No	
004	0083_MW102	HDPE (no PTFE)	20 mL	00350019106742	Grey	No	
004	0083_MW102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023778	Purple	No	
005	0083_MW101	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023515	Purple	No	
005	0083_MW101	Clear Plastic Bottle - Natural	250 mL	00070719042786	Green	No	
005	0083_MW101	HDPE (no PTFE)	20 mL	00350019106674	Grey	No	
005	0083_MW101	HDPE (no PTFE)	20 mL	00350019106692	Grey	No	
006	0083_MW017	Clear Plastic Bottle - Natural	250 mL	00070719042853	Green	No	
006	0083_MW017	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023449	Purple	No	
006	0083_MW017	HDPE (no PTFE)	20 mL	00350019106850	Grey	No	
006	0083_MW017	HDPE (no PTFE)	20 mL	00350019106862	Grey	No	
007	0083_QC301	HDPE (no PTFE)	20 mL	00352005007460	Grey	No	
007	0083_QC301	HDPE (no PTFE)	20 mL	00352005007479	Grey	No	

CHAIN OF CUSTODY

(ALS) COC#: **16130** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHA GW -

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

008	0083_QC401	HDPE (no PTFE)	20 mL	00352005002600	Grey	No	
008	0083_QC401	HDPE (no PTFE)	20 mL	00352005002709	Grey	No	
009	0083_QC302	HDPE (no PTFE)	20 mL	00352005007483	Grey	No	
009	0083_QC302	HDPE (no PTFE)	20 mL	00352005002526	Grey	No	
010	0083_QC402	HDPE (no PTFE)	20 mL	00352005006704	Grey	No	
010	0083_QC402	HDPE (no PTFE)	20 mL	00352005006835	Grey	No	
011	0083_QC303	HDPE (no PTFE)	20 mL	00352005002611	Grey	No	
011	0083_QC303	HDPE (no PTFE)	20 mL	00352005002679	Grey	No	
012	0083_QC403	HDPE (no PTFE)	20 mL	00352005005052	Grey	No	
012	0083_QC403	HDPE (no PTFE)	20 mL	00352005006748	Grey	No	

Total Bottle Count: ALS: 36, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012802**	Page	: 1 of 13
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020 11:15
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16130	Issue Date	: 03-Dec-2020 18:02
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_MW019_201118	0083_MW027_201118	0083_MW103_201118	0083_MW102_201118	0083_MW101_201118
			Sampling date / time	18-Nov-2020 09:23	18-Nov-2020 09:46	18-Nov-2020 10:05	18-Nov-2020 10:22	18-Nov-2020 10:39
Compound	CAS Number	LOR	Unit	EP2012802-001	EP2012802-002	EP2012802-003	EP2012802-004	EP2012802-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.66	7.74	7.74	7.73	7.56
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	20100	18600	14400	16200	18400
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	88	72	327	88	4030
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	330	355	307	285	686
Total Alkalinity as CaCO3	----	1	mg/L	330	355	307	285	686
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1380	1210	1060	1070	754
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	9600	8690	6920	7580	8100
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	282	295	261	254	218
Magnesium	7439-95-4	1	mg/L	710	624	500	525	651
Sodium	7440-23-5	1	mg/L	5470	4760	3720	4050	4760
Potassium	7440-09-7	1	mg/L	314	272	220	233	267
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	306	277	223	242	258
ø Total Cations	----	0.01	meq/L	318	280	222	238	278
ø Ionic Balance	----	0.01	%	1.98	0.48	0.40	0.79	3.81
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	40	24	8	50	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	----	----	----	142
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.10	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.07	0.03	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.03	0.24	0.45	0.39	0.25

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW019_201118	0083_MW027_201118	0083_MW103_201118	0083_MW102_201118	0083_MW101_201118
				Sampling date / time	18-Nov-2020 09:23	18-Nov-2020 09:46	18-Nov-2020 10:05	18-Nov-2020 10:22	18-Nov-2020 10:39
Compound	CAS Number	LOR	Unit		EP2012802-001	EP2012802-002	EP2012802-003	EP2012802-004	EP2012802-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.09**	**0.06**	**0.06**	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	**0.3**	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**0.04**	**0.94**	**0.32**	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	**0.08**	**0.84**	**0.45**	**0.22**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.04**	**0.18**	**0.27**	**0.10**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.01**	**0.02**	**0.06**	**0.02**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW019_201118	0083_MW027_201118	0083_MW103_201118	0083_MW102_201118	0083_MW101_201118
				Sampling date / time	18-Nov-2020 09:23	18-Nov-2020 09:46	18-Nov-2020 10:05	18-Nov-2020 10:22	18-Nov-2020 10:39
					EP2012802-001	EP2012802-002	EP2012802-003	EP2012802-004	EP2012802-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.03**	**0.50**	**2.96**	**1.58**	**0.59**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.03**	**0.33**	**0.51**	**0.45**	**0.25**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.03**	**0.50**	**2.89**	**1.55**	**0.59**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**116**	**111**	**108**	**119**	**102**
13C8-PFOA	----	0.02	%		**99.6**	**99.4**	**102**	**97.2**	**100**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW017_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 10:55	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012802-006	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.77**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**14200**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**368**	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**368**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**368**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**964**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**6300**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**238**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**494**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**3700**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**232**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**205**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**219**	----	----	----	----
ø Ionic Balance	----	0.01	%		**3.36**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**15**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.05**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.06**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**1.59**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.18**	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW017_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 10:55	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012802-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**15.4**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		**1.0**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**3.89**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**3.35**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**1.34**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.80**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.08**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW017_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 10:55	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012802-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**3.38**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**0.30**	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**31.4**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**17.0**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**31.1**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**114**	----	----	----	----
13C8-PFOA	----	0.02	%		**99.3**	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_QC301_201118	0083_QC401_201118	0083_QC302_201118	0083_QC402_201118	0083_QC303_201118
				Sampling date / time	18-Nov-2020 15:34	18-Nov-2020 15:35	18-Nov-2020 15:36	18-Nov-2020 15:38	18-Nov-2020 15:38
					EP2012802-007	EP2012802-008	EP2012802-009	EP2012802-010	EP2012802-011
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC301_201118	0083_QC401_201118	0083_QC302_201118	0083_QC402_201118	0083_QC303_201118
				Sampling date / time	18-Nov-2020 15:34	18-Nov-2020 15:35	18-Nov-2020 15:36	18-Nov-2020 15:38	18-Nov-2020 15:38
Compound	CAS Number	LOR	Unit		EP2012802-007	EP2012802-008	EP2012802-009	EP2012802-010	EP2012802-011
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**115**	**116**	**112**	**114**	**109**
13C8-PFOA	----	0.02	%		**102**	**105**	**105**	**105**	**101**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC403_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 15:39	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012802-012	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC403_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 15:39	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012802-012	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**116**	----	----	----	----
13C8-PFOA	----	0.02	%		**103**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012802**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16130	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005P: pH by PC Titrator (QC Lot: 3394148)									
EP2012802-002	0083_MW027_201118	EA005-P: pH Value	----	0.01	pH Unit	7.74	7.73	0.129	0% - 20%
EP2012854-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.47	7.47	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3382657)									
EP2012802-001	0083_MW019_201118	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	20100	20100	0.199	0% - 20%
EP2012840-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1850	1840	0.244	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3382658)									
EP2012802-001	0083_MW019_201118	EA025H: Suspended Solids (SS)	----	5	mg/L	88	88	0.00	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394147)									
EP2012802-002	0083_MW027_201118	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	355	375	5.54	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	355	375	5.54	0% - 20%
EP2012854-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	208	203	2.11	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	208	203	2.11	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3379469)									
EP2012802-001	0083_MW019_201118	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1380	1380	0.371	0% - 20%
EP2012854-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2120	2170	2.42	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3379470)									
EP2012802-001	0083_MW019_201118	ED045G: Chloride	16887-00-6	1	mg/L	9600	9570	0.224	0% - 20%
EP2012854-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	16100	16000	0.989	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3380584)									
EP2012802-001	0083_MW019_201118	ED093F: Calcium	7440-70-2	1	mg/L	282	278	1.37	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 3380584) - continued									
EP2012802-001	0083_MW019_201118	ED093F: Magnesium	7439-95-4	1	mg/L	710	705	0.603	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5470	5390	1.35	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	314	312	0.687	0% - 20%
EP2012854-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	373	385	3.23	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1160	1190	3.14	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8990	9320	3.66	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	548	571	4.12	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392469)									
EP2012802-001	0083_MW019_201118	EP002: Dissolved Organic Carbon	----	1	mg/L	40	40	0.00	0% - 20%
EP2012854-009	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	<1	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3389044)									
EP2013106-006	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	2	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3394148)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3382657)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.8	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3382658)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	106	89.1	120
				<5	1000 mg/L	100	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394147)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	109	81.2	126
				<1	200 mg/L	97.5	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3379469)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	96.6	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3379470)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3380584)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	108	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	105	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	113	73.2	116
				<1	100 mg/L	109	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3389044)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	110	87.2	116
				<1	100 mg/L	105	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386563)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	96.8	72.0	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386563) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	106	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	103	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	105	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	119	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	106	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386563)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	101	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	119	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	116	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	113	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	121	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	115	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386563)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	110	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	117	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	109	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	101	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	111	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386563)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	117	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	112	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	113	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	113	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3379469)							
EP2012802-001	0083_MW019_201118	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3379470)							
EP2012802-001	0083_MW019_201118	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)							
EP2012802-002	0083_MW027_201118	EP002: Dissolved Organic Carbon	----	100 mg/L	111	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3389044)							
EP2013106-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	111	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012802**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 12
Order number	: DEF19009/0083	No. of samples analysed	: 12

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012802--001	0083_MW019_201118	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2012802--001	0083_MW019_201118	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW019_201118,	0083_MW027_201118,	----	----	----	01-Dec-2020	18-Nov-2020	**13**
0083_MW103_201118,	0083_MW102_201118,						
0083_MW101_201118,	0083_MW017_201118						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	1	17	5.88	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**01-Dec-2020**	18-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**01-Dec-2020**	02-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW017_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
0083_MW101_201118	**18-Nov-2020**	**----**	----	----	**27-Nov-2020**	16-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118, 0083_QC301_201118, 0083_QC401_201118, 0083_QC302_201118, 0083_QC402_201118, 0083_QC303_201118, 0083_QC403_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118, 0083_QC301_201118, 0083_QC401_201118, 0083_QC302_201118, 0083_QC402_201118, 0083_QC303_201118, 0083_QC403_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118, 0083_QC301_201118, 0083_QC401_201118, 0083_QC302_201118, 0083_QC402_201118, 0083_QC303_201118, 0083_QC403_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW019_201118, 0083_MW027_201118, 0083_MW103_201118, 0083_MW102_201118, 0083_MW101_201118, 0083_MW017_201118, 0083_QC301_201118, 0083_QC401_201118, 0083_QC302_201118, 0083_QC402_201118, 0083_QC303_201118, 0083_QC403_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_MW019_201118,	0083_MW027_201118,	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
0083_MW103_201118,	0083_MW102_201118,							
0083_MW101_201118,	0083_MW017_201118,							
0083_QC301_201118,	0083_QC401_201118,							
0083_QC302_201118,	0083_QC402_201118,							
0083_QC303_201118,	0083_QC403_201118							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012854**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16121	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: AB DEF19009/HEHA		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 20-Nov-2020 11:15	Issue Date	: 23-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: **03-Dec-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 4.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 11 / 11

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012854-001	18-Nov-2020 08:44	0083_MW217_201118	✓	✓	✓	✓	✓	✓	✓
EP2012854-002	18-Nov-2020 09:20	0083_MW114_201118	✓	✓	✓	✓		✓	✓
EP2012854-003	18-Nov-2020 09:35	0083_MW113_201118	✓	✓	✓	✓		✓	✓
EP2012854-004	18-Nov-2020 10:01	0083_MW115_201118	✓	✓	✓	✓		✓	✓
EP2012854-005	18-Nov-2020 10:51	0083_MW202_201118	✓	✓	✓	✓	✓	✓	✓
EP2012854-006	18-Nov-2020 11:16	0083_MW111_201118	✓	✓	✓	✓	✓	✓	✓
EP2012854-007	18-Nov-2020 12:57	0083_MW110_201118	✓	✓	✓	✓	✓	✓	✓
EP2012854-008	18-Nov-2020 13:15	0083_MW109_201118	✓	✓	✓	✓	✓	✓	✓
EP2012854-009	18-Nov-2020 14:04	0083_OTH101_201118	✓	✓	✓	✓	✓	✓	✓
EP2012854-010	18-Nov-2020 14:14	0083_OTH109_201118	✓	✓	✓	✓	✓	✓	✓
EP2012854-011	18-Nov-2020 14:58	0083_OTH102_201118	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012854-001	18-Nov-2020 08:44	0083_MW217_201118		✓
EP2012854-002	18-Nov-2020 09:20	0083_MW114_201118	✓	✓
EP2012854-003	18-Nov-2020 09:35	0083_MW113_201118	✓	✓
EP2012854-004	18-Nov-2020 10:01	0083_MW115_201118	✓	✓
EP2012854-005	18-Nov-2020 10:51	0083_MW202_201118		✓
EP2012854-006	18-Nov-2020 11:16	0083_MW111_201118		✓
EP2012854-007	18-Nov-2020 12:57	0083_MW110_201118		✓
EP2012854-008	18-Nov-2020 13:15	0083_MW109_201118		✓
EP2012854-009	18-Nov-2020 14:04	0083_OTH101_201118		✓
EP2012854-010	18-Nov-2020 14:14	0083_OTH109_201118		✓
EP2012854-011	18-Nov-2020 14:58	0083_OTH102_201118		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0083_MW109_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW110_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW111_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW113_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW114_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW115_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW202_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW217_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_OTH101_2011	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_OTH102_2011	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_OTH109_2011	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CHAIN OF CUSTODY

(ALS) COC#: 16121 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	RMoore DATE TIME: 20/11/20 11:15	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW - Template

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_MW217		18/11/2020 08:44 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0083_MW114		18/11/2020 09:20 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0083_MW113		18/11/2020 09:35 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0083_MW115		18/11/2020 10:01 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0083_MW202		18/11/2020 10:51 AM	Water	ALS: 3 Non ALS: 1	No	X		
006	0083_MW111		18/11/2020 11:16 AM	Water	ALS: 4 Non ALS: 0	No	X		
007	0083_MW110		18/11/2020 12:57 PM	Water	ALS: 4 Non ALS: 0	No	X		
008	0083_MW109		18/11/2020 01:15 PM	Water	ALS: 4 Non ALS: 0	No	X		
009	0083_OTH101		18/11/2020 02:04 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012854

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: **16121** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW - Template

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0083_OTH109		18/11/2020 02:14 PM	Water	ALS: 4 Non ALS: 0	No	X		
011	0083_OTH102		18/11/2020 02:58 PM	Water	ALS: 4 Non ALS: 0	No	X		

CHAIN OF CUSTODY

(ALS) COC#: 16121 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW - Template

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW217	HDPE (no PTFE)	20 mL	00352005016252	Grey	No	
001	0083_MW217	HDPE (no PTFE)	20 mL	00352005016186	Grey	No	
001	0083_MW217	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056636	Purple	No	
001	0083_MW217	Clear Plastic Bottle - Natural	250 mL	00070719042895	Green	No	
002	0083_MW114	Clear Plastic Bottle - Natural	250 mL	00070719042694	Green	No	
002	0083_MW114	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056496	Purple	No	
002	0083_MW114	HDPE (no PTFE)	20 mL	00352005016063	Grey	No	
002	0083_MW114	HDPE (no PTFE)	20 mL	00352005016311	Grey	No	
003	0083_MW113	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056414	Purple	No	
003	0083_MW113	HDPE (no PTFE)	20 mL	00352005016292	Grey	No	
003	0083_MW113	HDPE (no PTFE)	20 mL	00352005016147	Grey	No	
003	0083_MW113	Clear Plastic Bottle - Natural	250 mL	00070719042685	Green	No	
004	0083_MW115	HDPE (no PTFE)	20 mL	00352005016310	Grey	No	
004	0083_MW115	HDPE (no PTFE)	20 mL	00352005016269	Grey	No	
004	0083_MW115	Clear Plastic Bottle - Natural	250 mL	00070719042681	Green	No	
004	0083_MW115	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056124	Purple	No	
005	0083_MW202	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056250	Purple	No	
005	0083_MW202	HDPE (no PTFE)	20 mL	00352005016335	Grey	No	
005	0083_MW202	Clear Plastic Bottle - Natural	250 mL	00070719042689	Green	No	
006	0083_MW111	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220065442	Purple	No	
006	0083_MW111	Clear Plastic Bottle - Natural	250 mL	00070719042699	Green	No	
006	0083_MW111	HDPE (no PTFE)	20 mL	00352005016331	Grey	No	
006	0083_MW111	HDPE (no PTFE)	20 mL	00352005016057	Grey	No	
007	0083_MW110	HDPE (no PTFE)	20 mL	00352005016134	Grey	No	
007	0083_MW110	HDPE (no PTFE)	20 mL	00352005016330	Grey	No	
007	0083_MW110	Clear Plastic Bottle - Natural	250 mL	00070719042816	Green	No	

CHAIN OF CUSTODY

COC#: 16121 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHA GW - Template

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0083_MW110	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023220	Purple	No	
008	0083_MW109	Clear Plastic Bottle - Natural	250 mL	00070719042810	Green	No	
008	0083_MW109	HDPE (no PTFE)	20 mL	00352005016116	Grey	No	
008	0083_MW109	HDPE (no PTFE)	20 mL	00352005016193	Grey	No	
008	0083_MW109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023724	Purple	No	
009	0083_OTH101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023755	Purple	No	
009	0083_OTH101	HDPE (no PTFE)	20 mL	00352005016055	Grey	No	
009	0083_OTH101	HDPE (no PTFE)	20 mL	00352005016041	Grey	No	
009	0083_OTH101	Clear Plastic Bottle - Natural	250 mL	00070719042778	Green	No	
010	0083_OTH109	HDPE (no PTFE)	20 mL	00352005016288	Grey	No	
010	0083_OTH109	HDPE (no PTFE)	20 mL	00352005016075	Grey	No	
010	0083_OTH109	Clear Plastic Bottle - Natural	250 mL	00070719042774	Green	No	
010	0083_OTH109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019022920	Purple	No	
011	0083_OTH102	HDPE (no PTFE)	20 mL	00352005016118	Grey	No	
011	0083_OTH102	HDPE (no PTFE)	20 mL	00352005016199	Grey	No	
011	0083_OTH102	Clear Plastic Bottle - Natural	250 mL	00070719042871	Green	No	
011	0083_OTH102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056660	Purple	No	

Total Bottle Count: ALS: 43, Non ALS: 1

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012854**	Page	: 1 of 12
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020 11:15
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16121	Issue Date	: 03-Dec-2020 18:03
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: AB DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 11		
No. of samples analysed	: 11		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_MW217_201118	0083_MW114_201118	0083_MW113_201118	0083_MW115_201118	0083_MW202_201118
			Sampling date / time	18-Nov-2020 08:44	18-Nov-2020 09:20	18-Nov-2020 09:35	18-Nov-2020 10:01	18-Nov-2020 10:51
Compound	CAS Number	LOR	Unit	EP2012854-001	EP2012854-002	EP2012854-003	EP2012854-004	EP2012854-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.84	7.62	7.64	7.72	7.67
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	27400	43100	41200	40000	33700
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	16	18200	974	21500	50
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	201	158	140	171	253
Total Alkalinity as CaCO3	----	1	mg/L	201	158	140	171	253
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1340	2810	2680	2580	2120
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12000	18400	18700	18700	16100
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	342	482	444	452	373
Magnesium	7439-95-4	1	mg/L	918	1480	1410	1380	1160
Sodium	7440-23-5	1	mg/L	7190	11400	10900	10700	8990
Potassium	7440-09-7	1	mg/L	417	553	524	512	548
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	370	581	586	585	503
ø Total Cations	----	0.01	meq/L	416	656	626	615	519
ø Ionic Balance	----	0.01	%	5.80	6.08	3.27	2.50	1.54
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	3	----	----	----	<1
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	10	6	4	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW217_201118	0083_MW114_201118	0083_MW113_201118	0083_MW115_201118	0083_MW202_201118
				Sampling date / time	18-Nov-2020 08:44	18-Nov-2020 09:20	18-Nov-2020 09:35	18-Nov-2020 10:01	18-Nov-2020 10:51
Compound	CAS Number	LOR	Unit		EP2012854-001	EP2012854-002	EP2012854-003	EP2012854-004	EP2012854-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW217_201118	0083_MW114_201118	0083_MW113_201118	0083_MW115_201118	0083_MW202_201118
				Sampling date / time	18-Nov-2020 08:44	18-Nov-2020 09:20	18-Nov-2020 09:35	18-Nov-2020 10:01	18-Nov-2020 10:51
					EP2012854-001	EP2012854-002	EP2012854-003	EP2012854-004	EP2012854-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**115**	**113**	**113**	**110**	**116**
13C8-PFOA	----	0.02	%		**102**	**98.7**	**108**	**102**	**103**

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW111_201118	0083_MW110_201118	0083_MW109_201118	0083_OTH101_201118	0083_OTH109_201118
				Sampling date / time	18-Nov-2020 11:16	18-Nov-2020 12:57	18-Nov-2020 13:15	18-Nov-2020 14:04	18-Nov-2020 14:14
					EP2012854-006	EP2012854-007	EP2012854-008	EP2012854-009	EP2012854-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.68**	**7.47**	**7.64**	**8.07**	**8.09**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**36500**	**40600**	**42700**	**41200**	**41500**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**187**	**444**	**141**	**54**	**80**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**360**	**208**	**116**	**113**	**115**
Total Alkalinity as CaCO3	----	1	mg/L		**360**	**208**	**116**	**113**	**115**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**2190**	**2630**	**2710**	**2680**	**2700**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**16700**	**18600**	**19200**	**19200**	**19100**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**443**	**475**	**450**	**467**	**452**
Magnesium	7439-95-4	1	mg/L		**1180**	**1390**	**1440**	**1490**	**1450**
Sodium	7440-23-5	1	mg/L		**9500**	**10800**	**11200**	**11500**	**11200**
Potassium	7440-09-7	1	mg/L		**594**	**518**	**536**	**546**	**536**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**524**	**584**	**600**	**600**	**597**
ø Total Cations	----	0.01	meq/L		**548**	**621**	**642**	**660**	**643**
ø Ionic Balance	----	0.01	%		**2.22**	**3.12**	**3.34**	**4.80**	**3.67**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**8**	**43**	**6**	**1**	**1**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW111_201118	0083_MW110_201118	0083_MW109_201118	0083_OTH101_201118	0083_OTH109_201118
				Sampling date / time	18-Nov-2020 11:16	18-Nov-2020 12:57	18-Nov-2020 13:15	18-Nov-2020 14:04	18-Nov-2020 14:14
					EP2012854-006	EP2012854-007	EP2012854-008	EP2012854-009	EP2012854-010
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW111_201118	0083_MW110_201118	0083_MW109_201118	0083_OTH101_201118	0083_OTH109_201118
				Sampling date / time	18-Nov-2020 11:16	18-Nov-2020 12:57	18-Nov-2020 13:15	18-Nov-2020 14:04	18-Nov-2020 14:14
					EP2012854-006	EP2012854-007	EP2012854-008	EP2012854-009	EP2012854-010
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**114**	**113**	**97.1**	**111**	**101**
13C8-PFOA	----	0.02	%		**102**	**101**	**100**	**102**	**102**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH102_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 14:58	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012854-011	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.00	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		42600	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		498	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		125	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		125	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2670	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		18800	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		455	----	----	----	----
Magnesium	7439-95-4	1	mg/L		1460	----	----	----	----
Sodium	7440-23-5	1	mg/L		11300	----	----	----	----
Potassium	7440-09-7	1	mg/L		539	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		588	----	----	----	----
ø Total Cations	----	0.01	meq/L		648	----	----	----	----
ø Ionic Balance	----	0.01	%		4.83	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		1	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH102_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 14:58	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012854-011	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH102_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 14:58	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012854-011	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**104**	----	----	----	----
13C8-PFOA	----	0.02	%		**107**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012854**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16121	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: AB DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 11		
No. of samples analysed	: 11		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394148)									
EP2012802-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.74	7.73	0.129	0% - 20%
EP2012854-007	0083_MW110_201118	EA005-P: pH Value	----	0.01	pH Unit	7.47	7.47	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3382696)									
EP2012854-001	0083_MW217_201118	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	27400	26000	5.17	0% - 20%
EP2012854-009	0083_OTH101_201118	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	41200	42300	2.66	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3382697)									
EP2012854-001	0083_MW217_201118	EA025H: Suspended Solids (SS)	----	5	mg/L	16	16	0.00	No Limit
EP2012854-011	0083_OTH102_201118	EA025H: Suspended Solids (SS)	----	5	mg/L	498	512	2.77	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394147)									
EP2012802-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	355	375	5.54	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	355	375	5.54	0% - 20%
EP2012854-007	0083_MW110_201118	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	208	203	2.11	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	208	203	2.11	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3379469)									
EP2012802-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1380	1380	0.371	0% - 20%
EP2012854-005	0083_MW202_201118	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2120	2170	2.42	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3379470)									
EP2012802-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	9600	9570	0.224	0% - 20%
EP2012854-005	0083_MW202_201118	ED045G: Chloride	16887-00-6	1	mg/L	16100	16000	0.989	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3380584)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 3380584) - continued									
EP2012802-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	282	278	1.37	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	710	705	0.603	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5470	5390	1.35	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	314	312	0.687	0% - 20%
EP2012854-005	0083_MW202_201118	ED093F: Calcium	7440-70-2	1	mg/L	373	385	3.23	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1160	1190	3.14	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8990	9320	3.66	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	548	571	4.12	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392469)									
EP2012802-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	40	40	0.00	0% - 20%
EP2012854-009	0083_OTH101_201118	EP002: Dissolved Organic Carbon	----	1	mg/L	1	<1	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3389044)									
EP2013106-006	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.01	2.31	13.9	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.19	0.23	17.7	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.22	0.24	11.9	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.69	1.96	14.9	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.09	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.07	0.08	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.09	0.11	24.1	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.45	0.53	15.0	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.05	0.06	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386942) - continued									
EP2012892-008	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.37	0.45	20.6	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	5.22	6.06	14.9	0% - 20%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3394148)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3382696)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.6	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3382697)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	105	89.1	120
				<5	1000 mg/L	100	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394147)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	109	81.2	126
				<1	200 mg/L	97.5	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3379469)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	96.6	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3379470)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3380584)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	108	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	105	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	113	73.2	116
				<1	100 mg/L	109	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3389044)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	110	87.2	116
				<1	100 mg/L	105	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386563)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	96.8	72.0	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386563) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	106	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	103	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	105	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	119	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	106	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386942)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	104	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	112	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	107	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	106	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386563)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	101	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	119	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	116	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	113	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	121	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	115	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386942)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	85.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	103	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	103	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	127	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	112	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386563)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	110	67.0	137

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386563) - continued								
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	117	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	109	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	101	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	111	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386942)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	108	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	119	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	130	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	104	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	89.4	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	104	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386563)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	117	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	112	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	113	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	113	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386942)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	95.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	125	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	105	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	97.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Matrix Spike (MS) Report		
Spike	SpikeRecovery(%)	Recovery Limits (%)

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3379469)							
EP2012802-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3379470)							
EP2012802-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)							
EP2012802-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	111	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3389044)							
EP2013106-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	111	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012854**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Site	: AB DEF19009/HEHA	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 11
Order number	: DEF19009/0083	No. of samples analysed	: 11

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012802--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2012802--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW217_201118,	0083_MW114_201118,	----	----	----	01-Dec-2020	18-Nov-2020	**13**
0083_MW113_201118,	0083_MW115_201118,						
0083_MW202_201118,	0083_MW111_201118,						
0083_MW110_201118,	0083_MW109_201118,						
0083_OTH101_201118,	0083_OTH109_201118,						
0083_OTH102_201118							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	39	2.56	10.00	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	1	17	5.88	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	39	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**01-Dec-2020**	18-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**01-Dec-2020**	02-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_MW217_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118	**18-Nov-2020**	**----**	----	----	**27-Nov-2020**	16-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_MW217_201118, 0083_MW114_201118, 0083_MW113_201118, 0083_MW115_201118, 0083_MW202_201118, 0083_MW111_201118, 0083_MW110_201118, 0083_MW109_201118, 0083_OTH101_201118, 0083_OTH109_201118, 0083_OTH102_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	39	**2.56**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	**5.56**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	39	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012855**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16129	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 20-Nov-2020 11:15	Issue Date	: 23-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: **03-Dec-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 4.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012855-001	18-Nov-2020 09:16	0083_SW112_201118	✓	✓	✓	✓	✓	✓	✓
EP2012855-002	18-Nov-2020 09:17	0083_QC107_201118	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012855-001	18-Nov-2020 09:16	0083_SW112_201118	✓
EP2012855-002	18-Nov-2020 09:17	0083_QC107_201118	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_QC107_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_SW112_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CHAIN OF CUSTODY

ALS COC#: 16129 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	RMoore DATE TIME: 20/11/20 1175	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA SW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SW112		18/11/2020 09:16 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0083_QC107		18/11/2020 09:17 AM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012855

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: **16129** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA SW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SW112	HDPE (no PTFE)	20 mL	00352005007529	Grey	No	
001	0083_SW112	HDPE (no PTFE)	20 mL	00352005007533	Grey	No	
001	0083_SW112	Clear Plastic Bottle - Natural	250 mL	00070719062390	Green	No	
001	0083_SW112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023727	Purple	No	
002	0083_QC107	Clear Plastic Bottle - Natural	250 mL	00070719062250	Green	No	
002	0083_QC107	HDPE (no PTFE)	20 mL	00352005006636	Grey	No	
002	0083_QC107	HDPE (no PTFE)	20 mL	00352005002533	Grey	No	
002	0083_QC107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023737	Purple	No	

Total Bottle Count: ALS: 8, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012855**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020 11:15
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16129	Issue Date	: 04-Dec-2020 21:00
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

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Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic Balance out of acceptable limits for sample #1 and 2 due to analytes not quantified in this report. Major cations (ED093F) and major anions (ED041G/ED045G) have been confirmed by re-analysis.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW112_201118	0083_QC107_201118	----	----	----
			Sampling date / time	18-Nov-2020 09:16	18-Nov-2020 09:17	----	----	----
Compound	CAS Number	LOR	Unit	EP2012855-001	EP2012855-002	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.70	7.77	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	236000	239000	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	986	198	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	201	200	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	201	200	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	12600	12700	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	105000	107000	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1020	1060	----	----	----
Magnesium	7439-95-4	1	mg/L	9150	9420	----	----	----
Sodium	7440-23-5	1	mg/L	70200	72600	----	----	----
Potassium	7440-09-7	1	mg/L	4130	4270	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	3230	3290	----	----	----
ø Total Cations	----	0.01	meq/L	3960	4100	----	----	----
ø Ionic Balance	----	0.01	%	10.2	11.0	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	42	36	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW112_201118	0083_QC107_201118	----	----	----
			Sampling date / time	18-Nov-2020 09:16	18-Nov-2020 09:17	----	----	----
Compound	CAS Number	LOR	Unit	EP2012855-001	EP2012855-002	--------	--------	--------
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW112_201118	0083_QC107_201118	----	----	----
				Sampling date / time	18-Nov-2020 09:16	18-Nov-2020 09:17	----	----	----
Compound	CAS Number	LOR	Unit		EP2012855-001	EP2012855-002	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**104**	**104**	----	----	----
13C8-PFOA	----	0.02	%		**111**	**111**	----	----	----

Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012855**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16129	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394148)									
EP2012802-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.74	7.73	0.129	0% - 20%
EP2012854-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.47	7.47	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3382696)									
EP2012854-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	27400	26000	5.17	0% - 20%
EP2012854-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	41200	42300	2.66	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3382697)									
EP2012854-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	16	16	0.00	No Limit
EP2012854-011	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	498	512	2.77	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394147)									
EP2012802-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	355	375	5.54	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	355	375	5.54	0% - 20%
EP2012854-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	208	203	2.11	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	208	203	2.11	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3379469)									
EP2012802-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1380	1380	0.371	0% - 20%
EP2012854-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2120	2170	2.42	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3379470)									
EP2012802-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	9600	9570	0.224	0% - 20%
EP2012854-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	16100	16000	0.989	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3380584)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 3380584) - continued									
EP2012802-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	282	278	1.37	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	710	705	0.603	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5470	5390	1.35	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	314	312	0.687	0% - 20%
EP2012854-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	373	385	3.23	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1160	1190	3.14	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8990	9320	3.66	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	548	571	4.12	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392469)									
EP2012802-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	40	40	0.00	0% - 20%
EP2012854-009	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	<1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.01	2.31	13.9	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.19	0.23	17.7	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.22	0.24	11.9	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.69	1.96	14.9	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.09	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.07	0.08	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.09	0.11	24.1	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.45	0.53	15.0	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.05	0.06	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386942) - continued									
EP2012892-008	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.37	0.45	20.6	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	5.22	6.06	14.9	0% - 20%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3394148)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3382696)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.6	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3382697)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	105	89.1	120
				<5	1000 mg/L	100	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394147)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	109	81.2	126
				<1	200 mg/L	97.5	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3379469)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	96.6	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3379470)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3380584)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	108	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	105	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	113	73.2	116
				<1	100 mg/L	109	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386942)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	104	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	112	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	107	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386942) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	106	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386942)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	85.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	103	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	103	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	127	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	112	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386942)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	108	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	119	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	130	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	104	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	89.4	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	104	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386942)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	95.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	125	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	105	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	97.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3379469)							
EP2012802-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3379470)							
EP2012802-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)							
EP2012802-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	111	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012855**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 2
Order number	: DEF19009/0083	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012802--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2012802--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0083_SW112_201118, 0083_QC107_201118	----	----	----	01-Dec-2020	18-Nov-2020	**13**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count: QC	Count: Regular	Rate (%): Actual	Rate (%): Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_SW112_201118, 0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**01-Dec-2020**	18-Nov-2020	×

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**01-Dec-2020**	02-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_SW112_201118,	0083_QC107_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	**5.56**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012856**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 5912	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 20-Nov-2020 11:15	Issue Date	: 23-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: **03-Dec-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 4.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2012856-001 : 18-Nov-2020 08:24 : 0083_SD120_0.00-0.10_201118
EP2012856-002 : 18-Nov-2020 09:13 : 0083_SD112_0.00-0.10_201118

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2012856-001	18-Nov-2020 08:24	0083_SD120_0.00-0.10...	✓	✓	✓	✓
EP2012856-002	18-Nov-2020 09:13	0083_SD112_0.00-0.10...	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CHAIN OF CUSTODY

COC#: 5912 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 20/11/20 11:15	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC- DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD120_0.00-0.10		18/11/2020 08:24 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0083_SD112_0.00-0.10		18/11/2020 09:13 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012856

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: **5912** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC- DEF19009/HEHA SED

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD120_0.00-0.10	Soil Glass Jar - Unpreserved	150 mL	00260520053070	Orange	No	
001	0083_SD120_0.00-0.10	HDPE Soil Jar	200 mL	00621019038127	Grey	No	
002	0083_SD112_0.00-0.10	Soil Glass Jar - Unpreserved	150 mL	00260220014688	Orange	No	
002	0083_SD112_0.00-0.10	HDPE Soil Jar	200 mL	00620719026366	Grey	No	

Total Bottle Count: ALS: 4, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012856**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020 11:15
Order number	: DEF19009/0083	Date Analysis Commenced	: 24-Nov-2020
C-O-C number	: 5912	Issue Date	: 03-Dec-2020 17:48
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X: High Matrix Spike (MS) recovery for analyte "N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE) and N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)" deemed acceptable as all associated analyte results are less than LOR.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD120_0.00-0.10_201118	0083_SD112_0.00-0.10_201118	----	----	----
			Sampling date / time	18-Nov-2020 08:24	18-Nov-2020 09:13	----	----	----
Compound	CAS Number	LOR	Unit	EP2012856-001	EP2012856-002	--------	--------	--------
				Result	Result	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.8	8.3	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	20200	12200	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	13.7	26.2	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	38.1	18.4	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	7.4	2.0	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.3	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.8	0.3	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	46.6	20.7	----	----	----
Exchangeable Sodium Percent	----	0.1	%	1.7	1.3	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	1.7	1.3	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD120_0.00-0.10_201118	0083_SD112_0.00-0.10_201118	----	----	----
				Sampling date / time	18-Nov-2020 08:24	18-Nov-2020 09:13	----	----	----
Compound	CAS Number	LOR	Unit		EP2012856-001	EP2012856-002	--------	--------	--------
					Result	Result	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	----	----	----
EP231P: PFAS Sums									

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD120_0.00-0.10_201118	0083_SD112_0.00-0.10_201118	----	----	----
				Sampling date / time	18-Nov-2020 08:24	18-Nov-2020 09:13	----	----	----
Compound	CAS Number	LOR	Unit		EP2012856-001	EP2012856-002	--------	--------	--------
					Result	Result	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**105**	**111**	----	----	----
13C8-PFOA	----	0.0002	%		**120**	**120**	----	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012856**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 24-Nov-2020
C-O-C number	: 5912	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3381257)									
EP2012741-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.3	9.6	2.86	0% - 20%
EP2012893-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.5	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381256)									
EP2012741-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	26400	26600	0.755	0% - 20%
EP2012893-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	166	166	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381261)									
EP2012801-001	Anonymous	EA055: Moisture Content	----	0.1	%	4.9	5.1	4.61	0% - 20%
EP2012895-004	Anonymous	EA055: Moisture Content	----	0.1	%	7.6	7.1	5.76	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3385244)									
EP2012741-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.4	1.3	7.27	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	54.7	54.9	0.367	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	6.1	7.1	15.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	61.8	63.0	1.86	0% - 20%
EP2012895-004	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.9	0.8	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.3	21.6	3.14	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.7	3.4	6.70	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	26.8	25.8	3.70	0% - 20%
EP004: Organic Matter (QC Lot: 3381248)									
EP2012801-001	Anonymous	EP004: Organic Matter	----	0.5	%	9.7	9.6	1.27	0% - 50%
EP2012895-005	Anonymous	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0012	0.0009	28.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0073	0.0068	6.91	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0052	0.0059	13.1	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0032	0.0036	12.8	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0020	0.0018	6.90	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0009	0.0008	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0009	0.0009	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495) - continued									
EP2012801-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	0.0200	0.0219	9.20	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0152	0.0150	1.21	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3381257)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	102	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3381256)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED008: Exchangeable Cations (QCLot: 3385244)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	95.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	119	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	96.4	79.9	110
EP004: Organic Matter (QCLot: 3381248)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	103	70.0	120
				<0.5	85 %	87.3	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	92.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.8	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.7	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.4	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.9	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	104	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	65.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.6	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	90.4	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	92.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	73.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	84.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	89.2	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	71.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	104	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	131	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	73.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	81.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	86.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	101	72.0	129

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495) - continued							
EP2012801-001	Anonymous	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	73.6	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	90.4	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	104	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	85.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	102	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	71.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.8	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	105	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 219	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 207	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	78.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	77.2	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	# Not Determined	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	# Not Determined	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	97.2	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012856**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 2
Order number	: DEF19009/0083	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2012801--001	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	**N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)**	24448-09-7	219 %	68.7-130%	**Recovery greater than upper data quality objective**
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	**N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)**	1691-99-2	207 %	65.1-134%	**Recovery greater than upper data quality objective**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	**6:2 Fluorotelomer sulfonic acid (6:2 FTS)**	27619-97-2	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	**8:2 Fluorotelomer sulfonic acid (8:2 FTS)**	39108-34-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**25-Nov-2020**	25-Nov-2020	✓	**25-Nov-2020**	25-Nov-2020	✓
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**25-Nov-2020**	25-Nov-2020	✓	**25-Nov-2020**	23-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**----**	----	----	**24-Nov-2020**	02-Dec-2020	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**27-Nov-2020**	16-Dec-2020	✓	**27-Nov-2020**	16-Dec-2020	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**30-Nov-2020**	16-Dec-2020	✓	**30-Nov-2020**	16-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)								
0083_SD120_0.00-0.10_201118,	0083_SD112_0.00-0.10_201118	**18-Nov-2020**	**26-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	05-Jan-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012904**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16131	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 20-Nov-2020 11:15	Issue Date	: 23-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: **03-Dec-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 4.6 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 6 / 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012904-001	18-Nov-2020 09:34	0083_MW123_201118	✓	✓	✓	✓	✓	✓	✓
EP2012904-002	18-Nov-2020 09:54	0083_MW213_201118	✓	✓	✓	✓	✓	✓	✓
EP2012904-003	18-Nov-2020 10:13	0083_MW104_201118	✓	✓	✓	✓	✓	✓	✓
EP2012904-004	18-Nov-2020 10:47	0083_MW112_201118	✓	✓	✓	✓	✓	✓	✓
EP2012904-005	18-Nov-2020 10:48	0083_OTH104_201118	✓	✓	✓	✓	✓	✓	✓
EP2012904-006	18-Nov-2020 14:26	0083_OTH110_201118	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012904-001	18-Nov-2020 09:34	0083_MW123_201118	✓
EP2012904-002	18-Nov-2020 09:54	0083_MW213_201118	✓
EP2012904-003	18-Nov-2020 10:13	0083_MW104_201118	✓
EP2012904-004	18-Nov-2020 10:47	0083_MW112_201118	✓
EP2012904-005	18-Nov-2020 10:48	0083_OTH104_201118	✓
EP2012904-006	18-Nov-2020 14:26	0083_OTH110_201118	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_MW104_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW112_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW123_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_MW213_20111	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----
0083_OTH104_2011	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	×	----	----

0083_OTH110_2011	Clear Plastic Bottle - Natural	----	18-Nov-2020	20-Nov-2020	✘	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)	Email	david.james@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	david.james@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	david.james@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	david.james@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	david.james@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	david.james@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	david.james@cardno.com.au
- EDI Format - XTab (XTAB)	Email	david.james@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CHAIN OF CUSTODY

ALS COC#: 16131 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	RMoore DATE TIME: ~~19/11/20 15:45~~ 20/11/20 11:15

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No (N/A)

Free ice / frozen ice bricks present upon receipt? (Yes) No N/A

Random Sample Temperature on Receipt: 10.1 ~~3.4~~ °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_MW123		18/11/2020 09:34 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0083_MW213		18/11/2020 09:54 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0083_MW104		18/11/2020 10:13 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0083_MW112		18/11/2020 10:47 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0083_OTH104		18/11/2020 10:48 AM	Water	ALS: 4 Non ALS: 0	No	X		
006	0083_OTH110		18/11/2020 02:26 PM	Water	ALS: 0 Non ALS: 0	No	X		Sampler forgot to scan bottles

Environmental Division
Perth
Work Order Reference
EP2012904

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: 16131 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, david.james@cardno.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW123	Clear Plastic Bottle - Natural	250 mL	00070719061748	Green	No	
001	0083_MW123	HDPE (no PTFE)	20 mL	00352005006722	Grey	No	
001	0083_MW123	HDPE (no PTFE)	20 mL	00352005006672	Grey	No	
001	0083_MW123	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023897	Purple	No	
002	0083_MW213	Clear Plastic Bottle - Natural	250 mL	00070719062451	Green	No	
002	0083_MW213	HDPE (no PTFE)	20 mL	00352005002609	Grey	No	
002	0083_MW213	HDPE (no PTFE)	20 mL	00352005006810	Grey	No	
002	0083_MW213	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023664	Purple	No	
003	0083_MW104	Clear Plastic Bottle - Natural	250 mL	00070719062282	Green	No	
003	0083_MW104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023742	Purple	No	
003	0083_MW104	HDPE (no PTFE)	20 mL	00352005006725	Grey	No	
003	0083_MW104	HDPE (no PTFE)	20 mL	00352005002636	Grey	No	
004	0083_MW112	Clear Plastic Bottle - Natural	250 mL	00070719062235	Green	No	
004	0083_MW112	HDPE (no PTFE)	20 mL	00352005006686	Grey	No	
004	0083_MW112	HDPE (no PTFE)	20 mL	00352005006707	Grey	No	
004	0083_MW112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023773	Purple	No	
005	0083_OTH104	Clear Plastic Bottle - Natural	250 mL	00070719062492	Green	No	
005	0083_OTH104	HDPE (no PTFE)	20 mL	00352005006581	Grey	No	
005	0083_OTH104	HDPE (no PTFE)	20 mL	00352005007464	Grey	No	
005	0083_OTH104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023877	Purple	No	

Total Bottle Count: ALS: 20, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012904**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020 11:15
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16131	Issue Date	: 03-Dec-2020 22:31
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW123_201118	0083_MW213_201118	0083_MW104_201118	0083_MW112_201118	0083_OTH104_201118
				Sampling date / time	18-Nov-2020 09:34	18-Nov-2020 09:54	18-Nov-2020 10:13	18-Nov-2020 10:47	18-Nov-2020 10:48
Compound	CAS Number	LOR	Unit		EP2012904-001	EP2012904-002	EP2012904-003	EP2012904-004	EP2012904-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.58	8.10	7.95	7.79	8.07
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		45100	2480	10100	39200	40300
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		524	548	352	306	136
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		139	176	245	135	121
Total Alkalinity as CaCO3	----	1	mg/L		139	176	245	135	121
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		3140	244	956	2750	2810
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		21800	1240	4820	19000	19500
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		544	90	179	461	462
Magnesium	7439-95-4	1	mg/L		1640	108	383	1460	1490
Sodium	7440-23-5	1	mg/L		12900	647	2620	11300	11600
Potassium	7440-09-7	1	mg/L		614	42	143	545	550
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		683	43.6	161	596	611
ø Total Cations	----	0.01	meq/L		739	42.6	158	649	664
ø Ionic Balance	----	0.01	%		3.93	1.14	0.84	4.23	4.18
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		2	3	3	2	1
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW123_201118	0083_MW213_201118	0083_MW104_201118	0083_MW112_201118	0083_OTH104_201118
				Sampling date / time	18-Nov-2020 09:34	18-Nov-2020 09:54	18-Nov-2020 10:13	18-Nov-2020 10:47	18-Nov-2020 10:48
Compound	CAS Number	LOR	Unit		EP2012904-001	EP2012904-002	EP2012904-003	EP2012904-004	EP2012904-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.03**	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW123_201118	0083_MW213_201118	0083_MW104_201118	0083_MW112_201118	0083_OTH104_201118
				Sampling date / time	18-Nov-2020 09:34	18-Nov-2020 09:54	18-Nov-2020 10:13	18-Nov-2020 10:47	18-Nov-2020 10:48
					EP2012904-001	EP2012904-002	EP2012904-003	EP2012904-004	EP2012904-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	**0.03**	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**0.03**	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.03**	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**99.0**	**105**	**97.3**	**101**	**97.3**
13C8-PFOA	----	0.02	%		**103**	**104**	**103**	**104**	**103**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_OTH110_201118	----	----	----	----
			Sampling date / time	18-Nov-2020 14:26	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2012904-006	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**8.11**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**39700**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**91**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**118**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**118**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**2780**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**19200**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**452**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**1450**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**11300**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**537**	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**602**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**647**	----	----	----	----
ø Ionic Balance	----	0.01	%	**3.63**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**1**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH110_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 14:26	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012904-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH110_201118	----	----	----	----
				Sampling date / time	18-Nov-2020 14:26	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012904-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**102**	----	----	----	----
13C8-PFOA	----	0.02	%		**102**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012904**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16131	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA005P: pH by PC Titrator (QC Lot: 3386348)									
EP2012948-006	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.75	7.76	0.129	0% - 20%
EP2012901-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.63	6.65	0.301	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3382717)									
EP2012904-001	0083_MW123_201118	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	45100	45400	0.707	0% - 20%
EP2012910-008	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	323	314	2.67	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3382718)									
EP2012904-001	0083_MW123_201118	EA025H: Suspended Solids (SS)	----	5	mg/L	524	526	0.476	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3386349)									
EP2012948-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	162	162	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	162	162	0.00	0% - 20%
EP2012901-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	29	29	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	29	29	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384199)									
EP2012897-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2830	2820	0.469	0% - 20%
EP2012947-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3030	3010	0.714	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384200)									
EP2012897-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19100	19500	2.27	0% - 20%
EP2012947-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	21000	20400	2.78	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3380584)									
EP2012802-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	282	278	1.37	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED093F: Dissolved Major Cations (QC Lot: 3380584) - continued									
EP2012802-001	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	710	705	0.603	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5470	5390	1.35	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	314	312	0.687	0% - 20%
EP2012854-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	373	385	3.23	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1160	1190	3.14	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8990	9320	3.66	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	548	571	4.12	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3380585)									
EP2012904-002	0083_MW213_201118	ED093F: Calcium	7440-70-2	1	mg/L	90	90	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	108	107	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	647	647	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	42	42	0.00	0% - 20%
EP2012996-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	30	30	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	29	29	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	166	169	1.35	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	9	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392504)									
EP2012892-006	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	5	43.7	No Limit
EP2012894-004	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	6	37.2	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3397199)									
EP2012904-004	0083_MW112_201118	EP002: Dissolved Organic Carbon	----	1	mg/L	2	3	0.00	No Limit
EP2012917-008	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	<1	2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.01	2.31	13.9	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.19	0.23	17.7	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.22	0.24	11.9	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.69	1.96	14.9	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.09	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.07	0.08	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.09	0.11	24.1	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.45	0.53	15.0	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.05	0.06	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386942) - continued									
EP2012892-008	Anonymous	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.37	0.45	20.6	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3386942)									
EP2012892-008	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	5.22	6.06	14.9	0% - 20%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3386348)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3382717)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.6	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3382718)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	89.1	120
				<5	1000 mg/L	100	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3386349)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	106	81.2	126
				<1	200 mg/L	101	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384199)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.2	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384200)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	98.9	87.9	114
				<1	1000 mg/L	99.2	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3380584)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	108	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	105	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	103	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3380585)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	98.5	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	95.8	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.5	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.9	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392504)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	97.6	73.2	116
				<1	100 mg/L	94.3	73.2	116

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3397199)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	96.8	73.2	116
				<1	100 mg/L	94.3	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386942)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	104	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	112	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	107	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	106	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386942)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	85.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	103	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	103	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	127	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	112	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386942)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	108	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	119	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	130	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	104	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	89.4	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	104	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386942)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	95.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	125	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	105	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	97.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384199)							
EP2012897-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384200)							
EP2012897-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392504)							
EP2012892-007	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	92.0	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3397199)							
EP2012904-005	0083_OTH104_201118	EP002: Dissolved Organic Carbon	----	100 mg/L	95.8	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012904**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 20-Nov-2020
Site	: DEF19009/HEHA	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 6
Order number	: DEF19009/0083	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012897--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2012897--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW123_201118,	0083_MW213_201118,	----	----	----	26-Nov-2020	18-Nov-2020	**8**
0083_MW104_201118,	0083_MW112_201118,						
0083_OTH104_201118,	0083_OTH110_201118						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**26-Nov-2020**	18-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**26-Nov-2020**	02-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**03-Dec-2020**	16-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**03-Dec-2020**	16-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**25-Nov-2020**	25-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**----**	----	----	**02-Dec-2020**	16-Dec-2020	✓
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118	**18-Nov-2020**	**----**	----	----	**30-Nov-2020**	16-Dec-2020	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_MW123_201118, 0083_MW213_201118, 0083_MW104_201118, 0083_MW112_201118, 0083_OTH104_201118, 0083_OTH110_201118	**18-Nov-2020**	**27-Nov-2020**	17-May-2021	✓	**27-Nov-2020**	17-May-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	6	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Monitoring Date	Location ID	Sample_ID	Screen Interval (bgl) (multi-level wells)	Bore Depth (m)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)	Other Observations on Bore/Site	Purge Method	Temp (Co)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	R1 - Eh (mV)	QC Dup Sample #	Odour ?	Colour
17/11/2020	MW003	0083_MW003_201117		4.5	3.02	3.263	0.243		HydroSleeve	29.4	1.16	28147	16867.5	6.21	-18.8		no	Clear
17/11/2020	MW008	0083_MW008_201117		4.12	2.61	2.846	0.236		HydroSleeve	30.7	1.52	35426	20728.5	5.8	21.2		no	Clear
18/11/2020	MW017	0083_MW017_201118			3.232	3.421	0.189		HydroSleeve	27	2.05	23984	15008.5	7.38	-153.7		no	Clear
18/11/2020	MW019	0083_MW019_201118		5.456	2.98	2.955	-0.025		HydroSleeve	26.5	0.85	31502	19935.5	6.9	-126.3		no	Brown
18/11/2020	MW027	0083_MW027_201118		6.809	4.551	4.499	-0.052		HydroSleeve	28	1.01	28811	17719	7.14	-116.9		no	Clear
18/11/2020	MW101	0083_MW101_201118		4.715	2.473	2.4356	-0.0374		HydroSleeve	28.7	4.09	27325	16763.5	7.11	-156.9		no	Brown
18/11/2020	MW102	0083_MW102_201118		5.784	2.49	2.6924	0.2024		HydroSleeve	28.1	0.81	26164	16074.5	7.11	-93.2		no	Brown
18/11/2020	MW103	0083_MW103_201118		5.428	2.857	2.7898	-0.0672		HydroSleeve	28.8	1.27	24780	15002	7.22	-118		no	Black
18/11/2020	MW104	0083_MW104_201118	5.5-6.0	6.385	4.04	3.9903	-0.0497		HydroSleeve	27.8	1.75	17742	10952	7.62	27		no	Clear
17/11/2020	MW105	0083_MW105_201117	4.0-4.5	4.48	2.98	3.1082	0.1282		HydroSleeve	33.6	0.79	42161	23549	7.42	-119.8	QC106, QC206	no	Clear
17/11/2020	MW107	0083_MW107_201117	5.5-6.0	6	4.36	4.7014	0.3414		HydroSleeve	30.3	1.52	55033		7.5	-2		no	Clear
18/11/2020	MW109	0083_MW109_201118	9.3-9.8	9.708	6.755	7.0413	0.2863		HydroSleeve	28.4	3.09	62657		7.69	-61.7		no	Clear
18/11/2020	MW110	0083_MW110_201118	9.0-9.5	9.13	7.872	8.2807	0.4087		HydroSleeve	29.1	2.1	61560	37115	7.59	-108.1		no	Clear
18/11/2020	MW111	0083_MW111_201118	10.5-11.0	11	8.495	8.8279	0.3329		HydroSleeve	28.9	1.76	57640	34905	7.65	-226.6		no	Clear
18/11/2020	MW112	0083_MW112_201118	4.5-5.0	5.48	2.66	3.0636	0.4036		HydroSleeve	27.3	1.96	59319	36920	4.57	244.2		no	Clear
18/11/2020	MW113	0083_MW113_201118	2.5-3.5	3.92	2.58	2.97	0.39		HydroSleeve	28.5	1.03	584		7.72	172.3		no	Clear
18/11/2020	MW114	0083_MW114_201118	2.0-3.0	3.25	2.64	2.9356	0.2956		HydroSleeve	28.3	2.18	54934		7.61	138		no	Clear
18/11/2020	MW115	0083_MW115_201118	4.5-5.0	4.17	2.41	2.6415	0.2315		HydroSleeve	28.7	1.35	64480		7.57	156.8		no	Clear
18/11/2020	MW116							bore locked									no	Clear
17/11/2020	MW117	0083_MW117_201117	4.0-4.5	4.86	2.57	2.6554	0.0854		HydroSleeve	28.7	4.1	54013		7.73	191.2		no	Clear
17/11/2020	MW119	0083_MW119_201117		5.19	3.45	3.5069	0.0569		HydroSleeve	2.4	1.95	98983	17368	8.34	-94.8		no	Clear
18/11/2020	MW123	0083_MW123_201118		3.1	0.77	0.5356	-0.2344		HydroSleeve	28.1	0.86	81271	49855	7.22	-80.5		no	Clear
17/11/2020	MW129	0083_MW129_201117	1.5-2.0	2.421	1.806	2.0256	0.2196		HydroSleeve	29.4	1.1	53939	32370	6.93	-106.8	QC102/202	no	Brown
17/11/2020	MW130	0083_MW130_201117	1.4-1.9	2.516	1.843	2.016	0.173		HydroSleeve	28.2	2.61	50748	31005	7.22	4.5	QC103/203	no	Brown
17/11/2020	MW134	0083_MW134_201117		12.549	9.981	10.0786	0.0976		HydroSleeve	27.4	1.86	41465	25740	7.12	41.8	QC105/205	no	Cloudy
18/11/2020	MW202	0083_MW202_201118			7.34	8.069	0.729		HydroSleeve	28.6	1.08	47777		7.7	-136.6		no	Clear
17/11/2020	MW210	0083_MW210_201117		3.5	2.585	2.863	0.278		HydroSleeve	29.2	1.52	30426	18310.5	7.9	-73.7		no	Clear
17/11/2020	MW212	0083_MW212_201117		3.89	3.24	3.513	0.273		HydroSleeve	30	1.71	37518	22139	7.33	14.9	QC104, QC204	no	Clear
18/11/2020	MW214	0083_MW213_201118		5.15	4.385	4.49	0.105	Water level shallow. Sampled with bailer	HandBailing	27.3	3.19	9389	5850	8.12	38.3		no	Clear
18/11/2020	MW213							Dry									no	Clear
18/11/2020	MW217	0083_MW217_201118		4.78	3.53	3.658	0.128		HydroSleeve	25.5	2.3	37920		7.67	127.2		no	Clear
17/11/2020	MW218	0083_MW218_201117		6.114	4.997	5.137	0.14		HydroSleeve	27.4	3.53	29933	18583.5	7.39	-24		no	Clear
17/11/2020	OTH002	0083_OTH002_201117			0.25				Direct into bottle	28.6	4.17	55836		8.13	82.4		no	Clear
18/11/2020	OTH101	0083_OTH101_201118			0.2				Direct into bottle	29.1	4.67	63065	37960	8.15	2.7		no	Clear
18/11/2020	OTH102	0083_OTH102_201118			0.6				Direct into bottle	27.5	4.3	61330		8.21	7.3		no	Clear
17/11/2020	OTH103	0083_OTH103_201117			0.25				Direct into bottle	28.4	4.84	29130		8.21	94.2		no	Clear
18/11/2020	OTH104	0083_OTH104_201118			1.2				Direct into bottle	26.3	1.49	60892	38545	7.88	93.1		no	Clear
17/11/2020	OTH105	0083_OTH105_201117			0.2				Direct into bottle	28.6	5.34	54876		8.18	167.6		no	Clear
17/11/2020	OTH106	0083_OTH106_201117			0.3				Direct into bottle	28	4.27	8.19		8.19	170.4		no	Clear
17/11/2020	OTH107	0083_OTH107_201117			0.3				Direct into bottle	28.4	4.28	55681		8.18	186.7		no	Clear
17/11/2020	OTH108	0083_OTH108_201117			0.6				Direct into bottle	30.4	3.66	55493		8.13	190.3		no	Clear
18/11/2020	OTH109	0083_OTH109_201118			0.4				Direct into bottle	28.5	3.73	62615	38025	8.22	-15.9		no	Clear
18/11/2020	OTH110	0083_OTH110_201118			0.2				Direct into bottle	28.4	1.1	61587	37635	8.21	7.1		no	Clear
17/11/2020	OTH113	0083_OTH113_201117			0.5				Direct into bottle	26.6	4.35	55753	35230	7.86	50		no	Clear

Location ID	Date	Sample ID	Sample Type	Sampling Method	Sample Depth (m)	WaterBody Depth (m)	Flow Rate	Comments	Temp (oC)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Water Colour	Turbidity
SD128	17/11/2020	0083_SD128_201117	Sediment	Direct into Bottle	0.1											
SW128	17/11/2020		Surface Water		0.1			Dry								
SD127	17/11/2020	0083_SD127_201117	Sediment	Direct into Bottle	0.1			Qc101/201								
SW127	17/11/2020		Surface Water		0.1			Dry								
SW126	17/11/2020		Surface Water		0.1			Dry								
SD126	17/11/2020	0083_SD126_201117	Sediment	Shovel Trowel	0.1											
SW120	18/11/2020		Surface Water		0.1			DRY								
SD120	18/11/2020	0083_SD120_201118	Sediment	Direct into Bottle,Shovel Trowel	0.1											
SW113	18/11/2020		Surface Water		0.1			Dry								
SD113	18/11/2020	0083_SD113_201118	Sediment	Shovel Trowel	0.1											
SD112	18/11/2020	0083_SD112_201118	Sediment	Direct into Bottle	0.2											
SW112	18/11/2020	0083_SW112_201118	Surface Water	Direct into Bottle	0.1	0.1	Slow	QC107, QC207	27.7	1.26	236394	46055	7.63	97.8	Clear/pink	Medium

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno
Contact: Ashley

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 19L102399
Cable length: 30m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	169.50 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 2 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature		Room Temp	20	0	°C	NA	20	°C
pH	pH 7.00	356684	7.01	-3.80	mV	6.94	7.01	pH
pH	pH 4.00	355385	4.00	165.70	mV	4.07	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.03	2919	2764	µs/cm
ORP (Reference check only)	Zobell A & B	335411/335412	240	240	mV	238.4	238.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	1.6	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	5.1	uA	111.2	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 12-Nov-20
Next Due: 11-May-21

Equipment Check Report

Water Level/Drawdown Meter

Customer: Cardno
Contact: Ashley

Manufacturer: QED
Instrument: MP30
Serial #: 1672
Cable length: 45m

Item	Test	Pass	Comments
Battery	Voltage (9v battery)	✓	Voltage above 7.9 V
	Capacity	✓	
Probe	Decontaminated	✓	
	Condition	✓	
	Operation	✓	
Connectors	Condition	✓	
Tape Check	Condition	✓	Good, no tears
	Decontaminated	✓	
Instrument Test	Water level mode	✓	
	Drawdown mode	✓	
Speaker	Operation	✓	

Comments

NA

This is to certify that the above instrument has been checked and is in good working order.

Checked by: Gaurav Kanwar

Check Date 13-Nov-20
Next Due: 12-May-21

ECO Environmental

Environmental monitoring
& sampling equipment
Rentals and sales.

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214 Lord St Perth WA 6000

EQUIPMENT INFORMATION

Instrument: YSIPP9

Serial Number: 15K100702 (Display)

Lot Number: 19F100572 (Sonde)

EQUIPMENT CHECK	Enclosed	Comment
YSI Pro Plus Display	☑	
YSI Quatro Sonde	☑	
Flow Cell	☑	
Probe Guard	☑	
Rubber Storage/Calibration	☑	
Sleeve Calibration Cup + Cap	☑	
YSI Pro Series ProComm II Kit	☑	
Instruction Manual & Field Sheets	☑	
Spare Batteries (x 2)	☑	

SENSOR CALIBRATION DETAILS

	Calibration Undertaken		Accuracy	Pass	Fail
Temperature	Factory Calibrated		±0.2°C	☑	☐
Dissolved Oxygen	☑ 100% Saturation		±2%	☑	☐
	Pressure Compensation		1034 hPa	☑	☐
Conductivity	☑ 1288mS/cm		±0.5%	☑	☐
	☑ Check linearity at 1.4mS/cm		±0.5%	☑	☐
Salinity	Auto Calibrated		±1%	☑	☐
pH	☑ pH 7.00		± 0.2	☑	☐
	☑ pH 4.00		± 0.2	☑	☐
ORP	☑ 240 mV at	20 °C	±20mV	☑	☐

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

ECO Environmental Equipment Specialist

Date: 05.10.2020

ECO Environmental

Environmental monitoring & sampling equipment Rentals and sales.

Tel: +61 8 9328 2900
fax: +61 8 9328 2677
eco@ecoenvironmental.com.au
www.ecoenvironmental.com.au

EQUIPMENT INFORMATION

Instrument: YSIPP13P

Serial Number: 14C102225 (Display)

Lot Number: 17F100380 (Sonde)

EQUIPMENT CHECK	Enclosed	Comment
YSI Pro Plus Display	☑	
YSI Quatro Sonde	☑	
Flow Cell	☑	
Probe Guard	☑	
Rubber Storage/Calibration	☑	
Sleeve Calibration Cup + Cap	☑	
YSI Pro Series ProComm II Kit	☑	
Instruction Manual & Field Sheets	☑	
Spare Batteries (x 2)	☑	

SENSOR CALIBRATION DETAILS

		Calibration Undertaken		Accuracy	Pass	Fail
Temperature		Factory Calibrated		±0.2°C	☑	☐
Dissolved Oxygen	☑	100% Saturation		±2%	☑	☐
		Pressure Compensation		1019 hPa	☑	☐
Conductivity	☑	1288mS/cm		±0.5%	☑	☐
	☑	Check linearity at 1.4mS/cm		±0.5%	☑	☐
Salinity		Auto Calibrated		±1%	☑	☐
pH	☑	pH 7.00		± 0.2	☑	☐
	☑	pH 4.00		± 0.2	☑	☐
ORP	☑	233 mV at	23 °C	±20mV	☑	☐

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

ECO Environmental Equipment Specialist

Date: 28.10.2020

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review
PFAS Ongoing Monitoring 2020 post-winter sampling event

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
	QA Documentation
Project Quality Plan/Work Plan and Data Quality Objectives	The field investigation was carried out between the 17 and 18 November 2020 and is in accordance with the proposed scope of work, as documented in the SAQP (DEF19009_ Harold E Holt Area A_SAQP_Rev2, Cardno 2020) issued to the client and in general compliance with the Australian standards AS 4482.1-2005 "*Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds",* Standards Australia 1998. AS/NZ 5667:1998 *Water quality – sampling* and NEPM "*National Environment Protection (Assessment of Site Contamination) Measure".* A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (2020 post-winter Sampling Event Factual Report). In addition, a safety, health and environment work method statement (SHEWMS) was also prepared. The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.
	Data Representativeness
Use of Composites	No Composites were used during the investigation
Holding Times	Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes. with the exception of the following: **Water:** • pH – generally 8 to 13 days overdue **Sediment:** • pH – generally 1 day overdue • Conductivity – generally 1 day overdue The holding time exceedances for pH and some analytes are due to the Site's remoteness and are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.
Verification of field procedures	The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP. Non-dedicated equipment was decontaminated between sample locations.

<table>
<tr><th>QA/QC Aspects</th><th>Evidence & Evaluation</th></tr>
<tr><td colspan="2">Data Precision & Accuracy</td></tr>
<tr><td>QC sample Frequency</td><td>
<table>
<tr><th>QC sample type</th><th>SAQP required frequency</th><th>Sample Collected</th></tr>
<tr><td>Blind duplicate</td><td>1 in 10 primary water samples (10%)
1 in 20 primary sediment samples (5%)</td><td>6 for 43 primary water samples (13.9%)
1 for 6 primary sediment samples (16.7%)</td></tr>
<tr><td>Split duplicate</td><td>1 in 10 primary water samples (10%)
1 in 20 primary sediment samples (5%)</td><td>6 for 43 primary water samples (13.9%)
1 for 6 primary sediment samples (16.7%)</td></tr>
<tr><td>Rinsate</td><td>1 per day per YSI</td><td>6 for 2 days (100%)</td></tr>
<tr><td>Field Blank</td><td>1 per day per sampler</td><td>6 for 2 days (100%)</td></tr>
</table>
</td></tr>
<tr><td>QC Testing – Blind Replicates (Primary Lab)</td><td>
▪ RPD Acceptance Criteria:
<table>
<tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr>
<tr><td>< 10 x LOR</td><td>No limit</td></tr>
<tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr>
<tr><td>> 20 x LOR</td><td>0% - 20%</td></tr>
</table>
Water
▪ Number of primary samples: 43
▪ Duplicate Samples Analysed: 6
▪ Percentage of RPDs above criteria: 4.2%
Sediment
▪ Number of primary samples: 6
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs above criteria: 10%
The level of RPD exceedances is generally minor and probably related to the low analyte concentrations of analyte pairs.
</td></tr>
<tr><td>QC Testing – Field Splits (Secondary Lab)</td><td>
▪ RPD Acceptance Criteria:
<table>
<tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr>
<tr><td>< 10 x LOR</td><td>No limit</td></tr>
<tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr>
<tr><td>> 20 x LOR</td><td>0% - 20%</td></tr>
</table>
Water
▪ Number of primary samples: 43
▪ Duplicate Samples Analysed: 6
▪ Percentage of RPDs above criteria: 11.4%
Sediment
▪ Number of primary samples: 6
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs above criteria: 3.1%
The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference or methodologies between the primary and secondary laboratories.
</td></tr>
<tr><td>Field Blanks</td><td>Field Blanks were collected at a rate of one per sampler per fieldwork day. All of the field blank samples tested reported analytes below the laboratory limit of reporting.</td></tr>
<tr><td>Laboratory Internal QC</td><td>Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and</td></tr>
</table>

QA/QC Aspects	Evidence & Evaluation
	satisfactory results for method blank, laboratory control samples and laboratory duplicates. All Matrix Spikes generally reported recoveries within the acceptance range of 70% to 130% with the exception of the following: • EP2012801, EP2012856 o PFOS, 6:2 FTS, 8:2 FTS. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. o MeFOSE, EtFOSE. Client Sample ID: Anonymous. MS recovery greater than upper data quality objective. • EP2012743 o Sulfate as SO4-. Client Sample ID: MW129. MS recovery not determined, background level greater than or equal to 4x spike level. o Chloride. Client Sample ID: MW129. MS recovery not determined, background level greater than or equal to 4x spike level. • EP2012749, EP2012854, EP2012855, EP2012904 o Sulfate as SO4-. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. o Chloride. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. • EP2012802 o Sulfate as SO4-. Client Sample ID: MW109. MS recovery not determined, background level greater than or equal to 4x spike level. o Chloride. Client Sample ID: MW109. MS recovery not determined, background level greater than or equal to 4x spike level. Quality Control sample frequency was generally within the expected rate with the exception of the following: • EP2012742, EP2012748 o PFAS. Duplicate sample frequency Actual rate < Expected rate (10%). • EP2012743, EP2012749, EP2012855, EP2012904 o PFAS. Duplicate sample frequency Actual rate < Expected rate (10%). o PFAS. MS sample frequency Actual rate < Expected rate (5%). • EP2012802, EP2012854 o PFAS & TOC. Duplicate sample frequency Actual rate < Expected rate (10%). o PFAS. MS sample frequency Actual rate < Expected rate (5%). No Method Blank value outliers were reported.
Laboratory Method Detection Limit	Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria. The 99% Species Protection Criteria for PFOS is lower than the current LOR. A practical screening value of 0.01 µg/L has been applied to PFOS based on the typical current laboratory limit of reporting, therefore it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels increased.
NATA endorsement of laboratory reports	Laboratory reports were stamped with the NATA endorsement stamp and signature. ALS Accreditation No. 825

QA/QC Aspects	Evidence & Evaluation
	Eurofins Accreditation No. 1261
Calibration of Field Equipment	All equipment used during the investigation was calibrated by the supplier prior to use. The equipment calibration certificates are provided in Appendix D.
Decontamination and Equipment Blanks	Rinsate blanks were collected by rinsing each non-dedicated water quality meter (YSI) at a rate of one per day. All rinsate samples tested reported analytes concentrations below the laboratory LORs.
Data Comparability	
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
Data Completeness	
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- A factual report of the condition of a portion of the site or one aspect of an entire site.
- Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- Validation of the success of remediation of a site or a portion of a site.
- Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide "environmental sign-off" of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants' duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the "hot spot" method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

PFAS OMP First Flush Sampling Event Factual Report

March 2021

Naval Communication Station Harold E Holt Area A

Prepared for

Department of Defence

24 May 2021

Cardno

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Rev 1	27/04/2021	Review	JS	MB
Rev 2	24/05/2021	Rev 2	MB	DJ

Table of Contents

Appendices

Tables

Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl Substances
PFHxS	Per-fluoro-hexane Sulphonate
PFOA	Per-fluoro-octanoic Acid
PFOS	Per-fluoro-octane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TSS	Total Suspended Solids

Technical Terms

AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
AST	Above-ground Storage Tank
BGL	Below Ground Level
COC	Chain of Custody
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan
SEPP	State Environment Protection Policy

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence ("the Client") to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) First Flush sampling event at Naval Communication Station Harold E Holt – Area A ("HEH-A" or "the Site"). The site is located at the end of the North West Cape of WA, at the northern edge of Exmouth and is displayed in Figure 1 of Appendix A.

The OMP was carried out in accordance with the scope and limitations presented in Cardno's Sampling and Analysis Quality Plan (SAQP):

> Cardno, June 2020, Reference: DEF19009, Rev2 'PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold E Holt – Area A'.

The SAQP was reviewed prior to the monitoring event and no changes were required in the SAQP.

For the purposes of this report:

> "the Site" was defined as Harold E Holt – Area A.

> "the Management Area" was defined as comprising the Site, plus the land extending to the Exmouth Gulf (to the east, north and north-west) (Figure 1, Appendix A).

1.2 Purpose & Objectives

The objective of the OMP is to assess the changes in the nature and extent of PFAS within the environment, specifically where there is an identified potentially elevated risk to a receptor or a potential future risk to a receptor associated with Defence's historical use of legacy Aqueous Film Forming Foam (AFFF).

The purpose of this PFAS OMP factual report is to provide an up-to-date status of the condition of the site as it is currently understood in relation to the most recent sampling event.

The objectives of the report are:

> To provide a succinct summary of the First Flush 2021 sampling event and provision of analytical results with supporting tables and figures.

> To provide confirmation of the current understanding of risk.

> To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

This assessment has been undertaken in general accordance with applicable industry standards for a site investigation for the purpose, objectives and scope identified in this report. These standards are set out in:

> National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).

> Heads of Environmental Protection Authority's Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.

> Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds.

> Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.

> Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

> Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites[1].

> Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.

> U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.

> USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

> National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

As per the SAQP requirements, the OMP First Flush monitoring event should be undertaken as close as possible following the first heavy rainfall of the wet season.

A heavy rainfall event, as defined in the Department of Environment and Energy (DoEE,2017) guidelines, occurred at the site on the 02 March 2021. The Bureau of Meteorology recorded 85.8 mm of rain at the Exmouth Town weather station (Station No. 5051) that day, which exceeds the heavy rainfall benchmark for March 2021 at this station (44.0 mm). Field observations (pers comm., Base personnel) confirmed flooding in the area which triggered the first flush sampling event.

Cardno carried out the tasks detailed in the following sections, on the 03 March 2021, in order to satisfy the purpose and objectives of this assessment.

2.1 Surface water Monitoring

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The surface water locations monitored as part of the OMP are presented in Table 2-1 and are shown on Figure 2, Appendix A.

Table 2-1 Surface water Monitoring Locations

Monitoring Area	Location ID
Broader area	0083_SW126; 0083_SW128; 0083_SW120; 0083_SW112; 0083_SW127
Powerhouse	0083_SW113

2.2 Sediment Monitoring

Sampling of selected sediment monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The sediment locations monitored as part of the OMP are presented in Table 2-2 and are shown on Figure 3, Appendix A.

Table 2-2 Sediment Monitoring Locations

Monitoring Area	Location ID
Broader area	0083_SD126, 0083_SD128, 0083_SD120, 0083_SD112, 0083_SD127
Powerhouse	0083_SD113

[1] It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site private properties and waterways.

2.3 Data Management

All the data included in this factual report has been collected, uploaded to the ESdat database and reviewed according to the data management requirements of the Defence Contamination Management Manual (DCMM) Annex L.

The sample naming convention detailed in the DCMM Annex L was used in the field.

2.3.1 Defence ESdat database

Data collected as part of the First Flush 2021 OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- All field data collected was uploaded;
- Laboratory data was uploaded and approved; and
- QA/QC data was reconciled.

2.4 Deviations from the OMP SAQP

Deviations from the SAQP for the First Flush 2021 monitoring event are presented in Table 2-3

Table 2-3 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
SW126	Not sampled	This location was found dry.

3 Methodology

3.1 Surface Water Sampling Methodology

Surface water monitoring procedure is detailed in Table 3-1.

Table 3-1 Surface water Monitoring Method

Activity	Details
Field parameters	The following field parameters were recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.
Sampling Method	Surface water samples were collected directly into sample containers using a 'Grab' (manual) sample method via a long handled sampling device. Where depth permits, the sample container was positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films. Samples were decanted into the laboratory supplied sample containers.
Decontamination procedure	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample was labelled with the sample location, date, project identification number and sampler's initials. Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under chain of custody (CoC) documentation.

Activity	Details
	Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	Surface water samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). ▪ Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH.

3.2 Sediment Sampling Methodology

Sediment sampling methodology is detailed in Table 3-2.

Table 3-2 Sediment Sampling Method

Activity	Details
Sample Collection	Sediment samples were collected at the sediment/water interface using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under CoC documentation. At each sampling location, the sediment sample was visually assessed and observations (including physical description) recorded on field data sheets.
Field Records	The following information was recorded on the field data sheets: ▪ Sampling time, date and name of the sampler. ▪ Weather conditions. ▪ Sample Collection method. ▪ Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.
Decontamination	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Laboratory Testing	Sediment samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Total organic carbon (TOC), electrical conductivity (EC), cation exchange capacity (CEC) and pH.

3.3 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

> QA documentation.
> Bias.
> Data Representativeness.
> Data Precision & Accuracy.
> Laboratory Performance.
> Data Comparability.
> Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E.

The QA/QC review concluded that there are no significant systematic errors in the data collection process and therefore, the dataset used for the assessment is considered valid and complete.

3.4 Assessment Criteria

3.4.1 Surface water

The adopted assessment criteria for surface water are detailed in Table 3-3.

Table 3-3 Criteria for Surface water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS	PFOA	
	µg/L		
Human Health – Recreational Water	2[1]	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023[2]	19	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020).

3.4.2 Sediment

It is noted that there are currently no Australian regulatory endorsed assessment levels for risk posed to ecology or human health by PFAS in sediment. As detailed in the SAQP (Cardno, 2020), sediment samples will be assessed with reference to the PFAS NEMP 2.0 (HEPA, 2020) soil criteria for consistency with the DSI (GHD, 2018). The adopted assessment criteria for sediment are detailed in Table 3-4.

Table 3-4 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS	PFOA	
	mg/kg		
Human Health - Commercial / industrial (on-base activities)	20[1]	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1[2]	10	HEPA 2020
Ecological - indirect exposure (interim guidelines)	0.01[2]	-	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only

4 Field Observations and Results

4.1 Surface water

4.1.1 Summary of Field Observations

Surface water was observed pooling in the drains (natural drainage channels and roadsides) and within the salt pan around site following the recent heavy rainfall event.

4.1.1.1 Physicochemical parameters

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the surface water sampling program are presented in field sampling record sheets, included in Appendix D. Parameters were generally consistent with the previous monitoring event. Surface water pH was near neutral, water was

mostly clear and hyper-saline. DO readings indicate aerobic surface water conditions. No visual or olfactory evidence of contamination were recorded.

4.1.2 Surface water Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Analytical data is presented in Table B1, Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figure 2 in Appendix A presents the surface water monitoring locations where a first time detection of Sum of Per-fluoro-octane Sulfonate (PFOS) and Per-fluoro-hexane Sulphonate (PFHxS) or Per-fluoro-octanoic Acid (PFOA), or a new exceedance of guideline values were reported. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Surface Water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	0.12	5	0
PFOS	SW113	0.00023[3]	0.21	5	1
Sum of PFHxS and PFOS	-	2[2]	0.35	5	0

Notes:

1. Non-inclusive of quality control samples
2. Human Health - Recreational Use Guideline (HEPA, 2020)
3. Ecological - 99% species protection level (HEPA, 2020) - LOR (0.01 µg/L) adopted as a practical screening value.

Findings are summarised as follows:

- There were no first-time detects above the laboratory LOR or new exceedances of the relevant assessment criteria at any of the surface water monitoring locations.
- Of the five surface water samples taken, one (SW113, within the Powerhouse source area) reported an exceedance of the Ecological 99% species protection criteria for PFOS.
- Four out of the five surface water samples taken did not report a concentration of PFAS above the laboratory limit of reporting (LOR).

4.2 Sediment

4.2.1 Summary of Field Observations

Field observations recorded at the time of sediment sampling are provided in Table D2, Appendix D.

4.2.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Sediment analytical results are presented in Table B2, Appendix B. A summary of results and the adopted criteria is presented in Table 4-2. Laboratory results have also been compared to available historical data, Figure 3 in Appendix A presents the sediment monitoring locations where a first time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Sediment Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (mg/kg)	Max Conc. (mg/kg)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	0.0009	6	0
PFOS	-	0.01[3]	0.0073	6	0
Sum of PFHxS and PFOS	-	20[4]	0.0511	6	0

Notes:

1. Non-inclusive of quality control samples
2. Ecological – Direct Exposure (HEPA, 2020)
3. Ecological – Indirect Exposure (HEPA, 2020)
4. Human Health – Commercial/Industrial (HEPA, 2020)

Findings are summarised as follows:

- One sediment sampling location (SD112) recorded a first time detect of Sum of PFOS and PFHxS.
- There were no new exceedances of the relevant assessment criteria at any of the sediment monitoring locations.
- None of the sediment samples reported an exceedance of the adopted assessment criteria.
- Four out of six sediment samples reported all PFAS concentrations below the laboratory LOR.

4.3 Changes to the Monitoring Network Condition

No changes to the monitoring network condition were noted during this sampling event.

5 Summary and Conclusions

Cardno undertook the First Flush 2021 surface water and sediment monitoring event at HEH-A as part of the PFAS OMP following the first heavy rainfall of the wet season. Surface water sampling and testing was undertaken at five (5) monitoring locations and sediment sampling and testing at six (6) locations. One surface water monitoring location was found dry and could not be sampled.

The surface water laboratory results reported the following:

- Of the five samples tested, PFOS (1 samples) was detected above the adopted ecological 99% species protection criteria (LOR adopted).
- Four out of five surface water samples reported all PFAS concentrations below the laboratory LOR.
- There were no first-time detects above the LOR or new exceedances of the relevant assessment criteria at any of the surface water monitoring locations.

The sediment laboratory results reported the following:

- Of the six samples that were tested, there were no exceedances of the relevant assessment criteria for any of the sediment samples.
- Four out of six sediment samples reported all PFAS concentrations below the laboratory LOR.
- One sediment sampling location (SD112) recorded a first time detect of Sum of PFOS and PFHxS.
- There was no new exceedance of the relevant assessment criteria at any of the sediment monitoring locations.

PFAS concentrations were generally within the historical range for all media sampled.

The next OMP sampling event for HEH-A will be the biannual monitoring event (Post-Summer 2021), scheduled for June 2021. An Annual Interpretive Report will be prepared following this event.

6 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. Bureau of Meteorology, Climate Data Online (http://www.bom.gov.au/climate/data/?ref=ftr)
5. *Contaminated Sites Act 2003*, Western Australia.
6. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
7. Department of Environment Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*.
8. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (https://maps.water.wa.gov.au/#/webmap/gwm).
9. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, '*Guidance on Environmental Data Verification and Data Validation'*.
10. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
11. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
12. National Health and Medical Research Council (NHMRC) (2011, as updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
13. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
14. Standards Australia/Standards New Zealand (1998) AS5667.1:1998 *'Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'*.
15. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
16. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
17. Department of Environment and Energy, 2017, Defence Contamination Management Manual (DCMM) Annex L, *'OMP Factual Report Writing Guidance'*.

Site Specific References

18. Cardno, June 2020, Reference: DEF19009, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt A'*.
19. Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter, HEH-A.
20. Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report HEH-A.
21. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-summer, HEH-A.
22. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-winter, HEH-A
23. Department of Defence, March 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Management Area Plan'.
24. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area A 'PFAS Ongoing Monitoring Plan'
25. GHD Pty Ltd, December 2018, Reference: 3135526,'Naval Communication Station Harold E Holt – Area A PFAS Investigations Detailed Site Investigation Report'.
26. GHD Pty Ltd, April 2019, Reference: 3135526, 'Harold E Holt A Ecological Risk Assessment'.

APPENDIX A

FIGURES

Harold E Holt Area A

North West Cape

Exmouth

Legend

Management Area / Commonwealth boundary

FIGURE 1

1:100,000 Scale at A3

Meters

0 1,500 3,000

Site Location

FIRST FLUSH SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-001_RegionalLocation 03.mxd
Aerial Imagery Supplied by Google Earth

FIGURE 2

1:25,000 Scale at A3

Meters

0 500 1,000

Surface Water Monitoring Locations & Results

FIRST FLUSH SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-002_Mar21_SW_Results 01.mxd

FIGURE 3

1:25,000 Scale at A3

Meters

0 500 1,000

Sediment Monitoring Locations & Results

FIRST FLUSH SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-003_Mar21_SD_Results 01.mxd

APPENDIX

B

DATA ASSESSMENT TABLES

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02
PFAS NEMP (HEPA, 2020) - Ecological - 99% Species Protection Level					*LOR**						*19*						
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water											**10**						
Field ID	**Location Code**	**Lab Report Number**	**Date**															
0083_SW112_210305	**SW112**	**EP2102350**	**5/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_SW113_210305	**SW113**	**EP2102350**	**5/03/2021**	<0.02	<0.02	0.14	<0.02	*0.21*	<0.02	<0.1	0.54	0.95	0.35	0.12	<0.02	<0.02	0.05	<0.05	<0.02	<0.02
0083_SW120_210303	**SW120**	**EP2102201**	**3/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_SW127_210303	**SW127**	**EP2102194**	**3/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_SW128_210303	**SW128**	**EP2102201**	**3/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02

Note:
LOR - Limit of reporting
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L based on typical current laboratory limit of reporting (HEPA, 2020)

	PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides							PFAS					
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting	0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01	1	1	1
PFAS NEMP (HEPA, 2020) - Ecological - 99% Species Protection Level																	
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water													2				
Field ID	**Location Code**	**Lab Report Number**	**Date**														
0083_SW112_210305	**SW112**	**EP2102350**	**5/03/2021**	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	90	<1
0083_SW113_210305	**SW113**	**EP2102350**	**5/03/2021**	<0.05	1.98	0.43	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	4.72	0.35	4.77	<1	53	<1
0083_SW120_210303	**SW120**	**EP2102201**	**3/03/2021**	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	68	<1
0083_SW127_210303	**SW127**	**EP2102194**	**3/03/2021**	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	60	<1
0083_SW128_210303	**SW128**	**EP2102201**	**3/03/2021**	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	50	<1

Note:
LOR - Limit of reporting
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L based on typical current laboratory limit of reporting (HEPA, 2020)

				Inorganics										Metals			Organic
				Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
				mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting				1	0.01	0.01	1	0.01	0.01	1	1	10	5	1	1	1	1
PFAS NEMP (HEPA, 2020) - Ecological - 99% Species Protection Level																	
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water																	
Field ID	**Location Code**	**Lab Report Number**	**Date**														
0083_SW112_210305	**SW112**	**EP2102350**	**5/03/2021**	90	314	308	9,330	1.00	7.33	5,120	2,380	18,800	8	685	534	291	33
0083_SW113_210305	**SW113**	**EP2102350**	**5/03/2021**	53	5.98	6.32	108	2.79	7.40	76	90	352	<5	48	6	5	51
0083_SW120_210303	**SW120**	**EP2102201**	**3/03/2021**	68	201	192	6,080	2.30	7.37	3,170	1,350	12,000	8	421	345	182	17
0083_SW127_210303	**SW127**	**EP2102194**	**3/03/2021**	60	156	151	4,170	1.72	7.49	2,340	1,800	9,740	13	558	220	129	17
0083_SW128_210303	**SW128**	**EP2102201**	**3/03/2021**	50	202	191	5,860	2.83	7.75	3,020	1,720	12,100	22	494	380	145	7

Note:
LOR - Limit of reporting
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L based on typical current laboratory limit of reporting (HEPA, 2020)

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic Acids			
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR - Limit of Reporting	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0005
PFAS NEMP (HEPA, 2020) Ecological – direct exposure (interim guidelines)					*1*						*10*										
PFAS NEMP (HEPA, 2020) Ecological – indirect exposure (interim guidelines) (on site)					**0.01**																
PFAS NEMP (HEPA, 2020) Commercial / industrial (on-base activities)											50										
Field ID	**Location Code**	**Lab Report Number**	**Date**																			
0083_SD112_210305	**SD112**	**EP2102349**	**5/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
0083_SD113_210305	**SD113**	**EP2102349**	**5/03/2021**	<0.0002	<0.0002	0.0002	<0.0002	0.0009	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	0.0012	0.0016	<0.0005
0083_SD120_210303	**SD120**	**EP2102202**	**3/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
0083_SD126_210303	**SD126**	**EP2102349**	**3/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
0083_SD127_210303	**SD127**	**EP2102349**	**3/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
0083_SD128_210303	**SD128**	**EP2102202**	**3/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005

Note:

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

	PFAS - Perfluoroalkyl Sulfonamides							PFAS			Inorganics									Organic
	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity *(lab)	pH (Lab)	Organic Matter
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%
LOR - Limit of Reporting	0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5
PFAS NEMP (HEPA, 2020) Ecological – direct exposure (interim guidelines)																				
PFAS NEMP (HEPA, 2020) Ecological – indirect exposure (interim guidelines) (on site)																				
PFAS NEMP (HEPA, 2020) Commercial / industrial (on-base activities)									20											
Field ID	**Location Code**	**Lab Report Number**	**Date**																	
0083_SD112_210305	**SD112**	**EP2102349**	**5/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0003	0.0003	0.0003	3.3	40.2	71.4	8.5	0.9	2.7	83.6	9,840	9.0	3.2
0083_SD113_210305	**SD113**	**EP2102349**	**5/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0039	0.0011	0.0039	1.4	6.4	19.4	1.6	<0.1	0.3	21.4	78	8.0	4.1
0083_SD120_210303	**SD120**	**EP2102202**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	25.0	38.8	4.1	0.2	0.3	43.4	5,470	8.4	0.9
0083_SD126_210303	**SD126**	**EP2102349**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.3	18.8	20.3	4.0	0.1	<0.1	24.6	2,220	8.9	0.6
0083_SD127_210303	**SD127**	**EP2102349**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.4	20.6	63.0	4.9	0.1	0.3	68.3	9,400	9.0	<0.5
0083_SD128_210303	**SD128**	**EP2102202**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	17.3	49.9	4.8	<0.1	0.5	55.2	4,610	8.9	0.9

Note:

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

				PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02
Field ID	**Sample Type**	**Lab Report Number**	**Date**																	
0083_QC301_210303	**Rinsate**	**EP2102201**	**3/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_QC301_210305	**Rinsate**	**EP2102350**	**5/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_QC302_210303	**Rinsate**	**EP2102201**	**3/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_QC401_210303	**Field Blank**	**EP2102201**	**3/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_QC401_210305	**Field Blank**	**EP2102350**	**5/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0083_QC402_210303	**Field Blank**	**EP2102201**	**3/03/2021**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02

				PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides							PFAS		
				4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
Field ID	**Sample Type**	**Lab Report Number**	**Date**														
0083_QC301_210303	Rinsate	EP2102201	3/03/2021	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC301_210305	Rinsate	EP2102350	5/03/2021	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC302_210303	Rinsate	EP2102201	3/03/2021	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC401_210303	Field Blank	EP2102201	3/03/2021	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC401_210305	Field Blank	EP2102350	5/03/2021	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC402_210303	Field Blank	EP2102201	3/03/2021	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Table B4 - Relative Percentage Difference (water samples)

	Field ID	0083_SW127_210303	0083_QC104_210303		0083_SW127_210303	0083_QC204_210303	
	Matrix Type	Water	Water		Water	Water	
	Lab Report Number	EP2102194	EP2102194		EP2102194	779429	
	Date	3/03/2021	3/03/2021	RPD	3/03/2021	3/03/2021	RPD
	Unit	EQL						
PFAS - Perfluoroalkyl Sulfonic Acids								
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01					<0.01	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01					<0.01	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0
PFAS - Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
PFAS								
Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.05	0
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.1	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					<0.01	
Sum of PFAS (PFOS + PFOA)	µg/L	0.01					<0.01	
Inorganics								
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	<10	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	60	52	14	60	61	2
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1	60	52	14	60	61	2
Anions Total	meq/L	0.01	156	160	3	156		
Cations Total	meq/L	0.01	151	154	2	151		
Chloride	mg/L	1	4,170	4,280	3	4,170	14	199
Ionic Balance	%	0.01	1.72	1.83	6	1.72		
pH (Lab)	pH Units	0.01	7.49	7.38	1	7.49	7.2	4
Sodium	mg/L	0.5					2,500	
Sodium (filtered)	mg/L	0.5	2,340	2,400	3	2,340		
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	1,800	1,850	3	1,800		
Sulphate	mg/L	5					5.0	
TDS	mg/L	10	9,740	9,860	1	9,740	10,000	3
Total Suspended Solids	mg/L	1	13	<5	89	13	11	17
Metals								
Calcium	mg/L	0.5					510	
Calcium (filtered)	mg/L	0.5	558	569	2	558		
Magnesium	mg/L	0.5					210	
Magnesium (filtered)	mg/L	0.5	220	223	1	220		
Potassium	mg/L	0.5					96	
Potassium (filtered)	mg/L	0.5	129	132	2	129		
Organic								
Dissolved Organic Carbon	mg/L	1	17	20	16	17	17	0

*RPDs have only been considered where a concentration is greater than 1 times the estimated quantitation limit (EQL).

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

	Field ID	0083_SD120_210303	0083_QC103_210303		0083_SD120_210303	0083_QC203_210303			
	Matrix Type	Sediment	Sediment		Sediment	Sediment			
	Lab Report Number	EP2102202	EP2102202		EP2102202	779429			
	Date	3/03/2021	3/03/2021	RPD	3/03/2021	3/03/2021	RPD		
	Unit	EQL							
PFAS - Perfluoroalkyl Sulfonic Acids									
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005				<0.005			
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005				<0.005			
Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
PFAS - Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0	
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
PFAS - Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
PFAS - Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	
PFAS									
Sum of PFAS (WA DER List)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	
Sum of PFHxS and PFOS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	
Sum of PFAS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.05	0	
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	0.005				<0.005			
Sum of PFAS (PFOS + PFOA)	mg/kg	0.005				<0.005			
Inorganics									
Conductivity (1:5 aqueous extract)	µS/cm	10				4,400			
Exchangeable Sodium Percent	%	0.1	0.8	0.9	12	0.8			
pH (1:5 Aqueous extract at 25Â°C as rec.)	pH Units	0.1				7.2			
Moisture Content	%	0.1	25.0	23.8	5	25.0	26	4	
Exchangeable Calcium	meq/100g	0.1	38.8	36.2	7	38.8			
Exchangeable Magnesium	meq/100g	0.1	4.1	3.9	5	4.1			
Exchangeable Potassium	meq/100g	0.1	0.2	0.2	0	0.2			
Exchangeable Sodium	meq/100g	0.1	0.3	0.4	29	0.3			
CEC	meq/100g	0.05	43.4	40.7	6	43.4	140	**105**	
Electrical conductivity *(lab)	µS/cm	1	5,470	5,730	5	5,470			
pH (Lab)	pH Units	0.1	8.4	8.4	0	8.4			
TOC	mg/kg	1,000					12,000		
Organic									
Organic Matter	%	0.5	0.9	0.9	0	0.9			

*RPDs have only been considered where a concentration is greater than 1 times the estimated quantitation limit (EQL).

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

APPENDIX

C

LABORATORY CERTIFICATES

CHAIN OF CUSTODY

(ALS) COC#: 19837 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SW - ab

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 08.03.21 1140	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SW127	DOC	03/03/2021 07:03 PM	Water	ALS: 3 Non ALS: 1	No	X		
002	0083_QC104	doc	03/03/2021 07:05 PM	Water	ALS: 3 Non ALS: 1	No	X		

Environmental Division Perth

Work Order Reference

EP2102194

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: **19837** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SW - ab

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SW127	Clear Plastic Bottle - Natural	250 mL	00070220154890	Green	No	
001	0083_SW127	HDPE (no PTFE)	20 mL	00350019126893	Grey	No	
001	0083_SW127	HDPE (no PTFE)	20 mL	00350019102484	Grey	No	
002	0083_QC104	HDPE (no PTFE)	20 mL	00350019102608	Grey	No	
002	0083_QC104	HDPE (no PTFE)	20 mL	00350019102440	Grey	No	
002	0083_QC104	Clear Plastic Bottle - Natural	250 mL	00070220155439	Green	No	

Total Bottle Count: ALS: 6, Non ALS: 2

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102194**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 19837	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 08-Mar-2021 11:40	Issue Date	: 08-Mar-2021
Client Requested Due Date	: 18-Mar-2021	Scheduled Reporting Date	: **18-Mar-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 6	Temperature	: 28.7
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2102194-001	03-Mar-2021 19:03	0083_SW127_210303	✓	✓	✓	✓	✓	✓	✓
EP2102194-002	03-Mar-2021 19:05	0083_QC104_210303	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2102194-001	03-Mar-2021 19:03	0083_SW127_210303	✓
EP2102194-002	03-Mar-2021 19:05	0083_QC104_210303	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_QC104_210303	Clear Plastic Bottle - Natural	----	04-Mar-2021	08-Mar-2021	×	----	----
0083_SW127_210303	Clear Plastic Bottle - Natural	----	04-Mar-2021	08-Mar-2021	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2102194**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021 11:40
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19837	Issue Date	: 15-Mar-2021 10:29
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW127_210303	0083_QC104_210303	----	----	----
				Sampling date / time	03-Mar-2021 19:03	03-Mar-2021 19:05	----	----	----
Compound	CAS Number	LOR	Unit		EP2102194-001	EP2102194-002	--------	--------	--------
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.49	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		9740	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		13	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		60	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		60	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1800	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		4170	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		558	----	----	----	----
Magnesium	7439-95-4	1	mg/L		220	----	----	----	----
Sodium	7440-23-5	1	mg/L		2340	----	----	----	----
Potassium	7440-09-7	1	mg/L		129	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		156	----	----	----	----
ø Total Cations	----	0.01	meq/L		151	----	----	----	----
ø Ionic Balance	----	0.01	%		1.72	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		17	20	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW127_210303	0083_QC104_210303	----	----	----
			Sampling date / time	03-Mar-2021 19:03	03-Mar-2021 19:05	----	----	----
Compound	CAS Number	LOR	Unit	EP2102194-001	EP2102194-002	--------	--------	--------
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW127_210303	0083_QC104_210303	----	----	----
				Sampling date / time	03-Mar-2021 19:03	03-Mar-2021 19:05	----	----	----
Compound	CAS Number	LOR	Unit		EP2102194-001	EP2102194-002	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**85.5**	----	----	----	----
13C8-PFOA	----	0.02	%		**104**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	0083_QC104_210303	----	----	----	----
			Sampling date / time	03-Mar-2021 19:05	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2102194-002	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.38**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**9860**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**52**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**52**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**1850**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**4280**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**569**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**223**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**2400**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**132**	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**160**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**154**	----	----	----	----
ø Ionic Balance	----	0.01	%	**1.83**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC104_210303	----	----	----	----
				Sampling date / time	03-Mar-2021 19:05	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2102194-002	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC104_210303	----	----	----	----
				Sampling date / time	03-Mar-2021 19:05	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2102194-002	--------	--------	--------	--------
					Result	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**96.7**	----	----	----	----
13C8-PFOA	----	0.02	%		**96.3**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2102194**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19837	Issue Date	: 15-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3553098)									
EP2102193-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.17	8.15	0.245	0% - 20%
EP2102258-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.39	8.40	0.119	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3552082)									
EP2102193-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	51000	50200	1.50	0% - 20%
EP2102201-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	12000	11800	1.26	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3552083)									
EP2102193-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
EP2102211-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	32	33	3.89	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3553097)									
EP2102193-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	107	102	4.51	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	107	102	4.51	0% - 20%
EP2102258-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	64	63	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	65	65	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3551442)									
EP2102193-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3930	3930	0.0290	0% - 20%
EP2102262-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3551443)									
EP2102193-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	25000	25200	1.02	0% - 20%
EP2102262-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	4	4	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3552543)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3552543) - continued									
EP2102193-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	737	724	1.83	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2040	1990	2.52	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	16300	15800	2.91	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	986	953	3.35	0% - 20%
EP2102258-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	12	11	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	32	30	5.81	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3552889)									
EP2102193-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	12	12	0.00	0% - 50%
EP2102271-004	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	7	6	19.7	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556017) - continued									
EP2102262-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3553098)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3552082)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3552083)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3553097)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	88.1	81.2	126
				<1	200 mg/L	93.5	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551442)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	106	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3551443)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3552543)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.1	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.7	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3552889)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	109	73.2	116
				<1	100 mg/L	107	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	97.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	94.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	92.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556017)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	93.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	77.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	96.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	97.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	82.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	124	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	124	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	88.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	117	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	83.4	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	92.9	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	110	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	74.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	123	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	111	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556017)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	100	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	118	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	107	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551442)							
EP2102193-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3551443)							
EP2102193-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3552889)							
EP2102193-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	108	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	79.8	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	107	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	97.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	109	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	82.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	83.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	88.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	110	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	103	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	72.4	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	97.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	104	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	92.2	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	125	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	101	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	85.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	121	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	88.1	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	92.7	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	111	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	73.8	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	129	65.0	136

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017) - continued							
EP2102262-004	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	108	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	103	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	102	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	100	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	83.8	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2102194**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/HEHA	Issue Date	: 15-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 2
Order number	: DEF19009/0083	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2102193--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2102193--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0083_SW127_210303, 0083_QC104_210303	----	----	----	09-Mar-2021	04-Mar-2021	**5**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	19	5.26	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_SW127_210303, 0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	04-Mar-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_SW127_210303, 0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	17-Mar-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**11-Mar-2021**	31-Mar-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**11-Mar-2021**	31-Mar-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	31-Mar-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_SW127_210303,	0083_QC104_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	**12.50**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	**12.50**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	16	**6.25**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

ALS COC#: 19809 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: EG 08.03.21 1140	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SW - SC

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Rinsate WATER	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SW128		03/03/2021 05:19 PM	Water	ALS: 4 Non ALS: 0	No		X		
002	0083_SW120		03/03/2021 06:04 PM	Water	ALS: 4 Non ALS: 0	No		X		
003	0083_QC301		03/03/2021 06:56 PM	Water	ALS: 2 Non ALS: 0	No	X			
004	0083_QC401		03/03/2021 06:57 PM	Water	ALS: 2 Non ALS: 0	No	X			
005	0083_QC302		03/03/2021 07:02 PM	Water	ALS: 2 Non ALS: 0	No	X			
006	0083_QC402		03/03/2021 07:03 PM	Water	ALS: 2 Non ALS: 0	No	X			

Environmental Division
Perth
Work Order Reference
EP2102201

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: 19809 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SW - SC

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SW128	Clear Plastic Bottle - Natural	250 mL	00070719041843	Green	No	
001	0083_SW128	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049205	Purple	No	
001	0083_SW128	HDPE (no PTFE)	20 mL	00350019170823	Grey	No	
001	0083_SW128	HDPE (no PTFE)	20 mL	00350019170993	Grey	No	
002	0083_SW120	Clear Plastic Bottle - Natural	250 mL	00070519143691	Green	No	
002	0083_SW120	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023780	Purple	No	
002	0083_SW120	HDPE (no PTFE)	20 mL	00352005006751	Grey	No	
002	0083_SW120	HDPE (no PTFE)	20 mL	00352005006778	Grey	No	
003	0083_QC301	HDPE (no PTFE)	20 mL	00350019026898	Grey	No	
003	0083_QC301	HDPE (no PTFE)	20 mL	00350019034989	Grey	No	
004	0083_QC401	HDPE (no PTFE)	20 mL	00350019042004	Grey	No	
004	0083_QC401	HDPE (no PTFE)	20 mL	00350019042178	Grey	No	
005	0083_QC302	HDPE (no PTFE)	20 mL	00350019042144	Grey	No	
005	0083_QC302	HDPE (no PTFE)	20 mL	00350019042184	Grey	No	
006	0083_QC402	HDPE (no PTFE)	20 mL	00350019177421	Grey	No	
006	0083_QC402	HDPE (no PTFE)	20 mL	00350019041168	Grey	No	

Total Bottle Count: ALS: 16, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102201**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 19809	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 08-Mar-2021 11:40	Issue Date	: 08-Mar-2021
Client Requested Due Date	: 18-Mar-2021	Scheduled Reporting Date	: **18-Mar-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 6	Temperature	: 28.7
Receipt Detail	:	No. of samples received / analysed	: 6 / 6

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2102201-001	03-Mar-2021 17:19	0083_SW128_210303	✓	✓	✓	✓	✓	✓	✓
EP2102201-002	03-Mar-2021 18:04	0083_SW120_210303	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2102201-001	03-Mar-2021 17:19	0083_SW128_210303	✓
EP2102201-002	03-Mar-2021 18:04	0083_SW120_210303	✓
EP2102201-003	03-Mar-2021 18:56	0083_QC301_210303	✓
EP2102201-004	03-Mar-2021 18:57	0083_QC401_210303	✓
EP2102201-005	03-Mar-2021 19:02	0083_QC302_210303	✓
EP2102201-006	03-Mar-2021 19:03	0083_QC402_210303	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_SW120_21030	Clear Plastic Bottle - Natural	----	04-Mar-2021	08-Mar-2021	×	----	----
0083_SW128_21030	Clear Plastic Bottle - Natural	----	03-Mar-2021	08-Mar-2021	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2102201**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021 11:40
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19809	Issue Date	: 15-Mar-2021 10:29
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW128_210303	0083_SW120_210303	0083_QC301_210303	0083_QC401_210303	0083_QC302_210303
			Sampling date / time	03-Mar-2021 17:19	03-Mar-2021 18:04	03-Mar-2021 18:56	03-Mar-2021 18:57	03-Mar-2021 19:02
Compound	CAS Number	LOR	Unit	EP2102201-001	EP2102201-002	EP2102201-003	EP2102201-004	EP2102201-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.75	7.37	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	12100	12000	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	22	8	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	50	68	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	50	68	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1720	1350	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	5860	6080	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	494	421	----	----	----
Magnesium	7439-95-4	1	mg/L	380	345	----	----	----
Sodium	7440-23-5	1	mg/L	3020	3170	----	----	----
Potassium	7440-09-7	1	mg/L	145	182	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	202	201	----	----	----
ø Total Cations	----	0.01	meq/L	191	192	----	----	----
ø Ionic Balance	----	0.01	%	2.83	2.30	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	7	17	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW128_210303	0083_SW120_210303	0083_QC301_210303	0083_QC401_210303	0083_QC302_210303
				Sampling date / time	03-Mar-2021 17:19	03-Mar-2021 18:04	03-Mar-2021 18:56	03-Mar-2021 18:57	03-Mar-2021 19:02
Compound	CAS Number	LOR	Unit		EP2102201-001	EP2102201-002	EP2102201-003	EP2102201-004	EP2102201-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW128_210303	0083_SW120_210303	0083_QC301_210303	0083_QC401_210303	0083_QC302_210303
			Sampling date / time	03-Mar-2021 17:19	03-Mar-2021 18:04	03-Mar-2021 18:56	03-Mar-2021 18:57	03-Mar-2021 19:02
Compound	CAS Number	LOR	Unit	EP2102201-001	EP2102201-002	EP2102201-003	EP2102201-004	EP2102201-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	**87.2**	**91.3**	**91.5**	**88.9**	**87.3**
13C8-PFOA	----	0.02	%	**108**	**106**	**100**	**113**	**107**

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_QC402_210303	----	----	----	----
				Sampling date / time	03-Mar-2021 19:03	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2102201-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_QC402_210303	----	----	----	----
				Sampling date / time	03-Mar-2021 19:03	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2102201-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**84.2**	----	----	----	----
13C8-PFOA	----	0.02	%		**101**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2102201**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19809	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3553098)									
EP2102193-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.17	8.15	0.245	0% - 20%
EP2102258-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.39	8.40	0.119	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3552082)									
EP2102193-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	51000	50200	1.50	0% - 20%
EP2102201-002	0083_SW120_210303	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	12000	11800	1.26	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3552083)									
EP2102193-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
EP2102211-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	32	33	3.89	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3553097)									
EP2102193-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	107	102	4.51	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	107	102	4.51	0% - 20%
EP2102258-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	64	63	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	65	65	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3551442)									
EP2102193-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3930	3930	0.0290	0% - 20%
EP2102262-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3551443)									
EP2102193-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	25000	25200	1.02	0% - 20%
EP2102262-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	4	4	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3552543)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3552543) - continued									
EP2102193-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	737	724	1.83	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2040	1990	2.52	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	16300	15800	2.91	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	986	953	3.35	0% - 20%
EP2102258-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	12	11	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	32	30	5.81	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3553745)									
EP2102201-001	0083_SW128_210303	EP002: Dissolved Organic Carbon	----	1	mg/L	7	7	0.00	No Limit
EP2102258-011	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	8	9	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556017) - continued									
EP2102262-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3556017)									
EP2102262-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3553098)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3552082)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3552083)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3553097)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	88.1	81.2	126
				<1	200 mg/L	93.5	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551442)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	106	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3551443)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3552543)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.1	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.7	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	110	73.2	116
				<1	100 mg/L	109	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	97.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	94.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	92.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556017)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	93.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	77.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	96.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	97.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	82.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	124	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	124	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	88.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	117	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	83.4	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	92.9	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	110	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	74.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	123	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	111	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556017)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	100	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	118	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	107	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551442)							
EP2102193-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3551443)							
EP2102193-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)							
EP2102201-002	0083_SW120_210303	EP002: Dissolved Organic Carbon	----	100 mg/L	110	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	79.8	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	107	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	97.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	109	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	82.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	83.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	88.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	110	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	103	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	72.4	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	97.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	104	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	92.2	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	125	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	101	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	85.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	121	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	88.1	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	92.7	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	111	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	73.8	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	129	65.0	136

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017) - continued							
EP2102262-004	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	108	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556017)							
EP2102262-004	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	103	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	102	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	100	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	83.8	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2102201**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/HEHA	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 6
Order number	: DEF19009/0083	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2102193--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2102193--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0083_SW128_210303, 0083_SW120_210303	----	----	----	09-Mar-2021	04-Mar-2021	**5**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	19	5.26	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_SW128_210303, 0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	04-Mar-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_SW128_210303, 0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_SW128_210303,	0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_SW128_210303,	0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	17-Mar-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_SW128_210303,	0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**11-Mar-2021**	31-Mar-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_SW128_210303,	0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**11-Mar-2021**	31-Mar-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_SW128_210303,	0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_SW128_210303,	0083_SW120_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	31-Mar-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW128_210303,	0083_SW120_210303,	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
0083_QC301_210303,	0083_QC401_210303,							
0083_QC302_210303,	0083_QC402_210303							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW128_210303,	0083_SW120_210303,	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
0083_QC301_210303,	0083_QC401_210303,							
0083_QC302_210303,	0083_QC402_210303							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_SW128_210303,	0083_SW120_210303,	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
0083_QC301_210303,	0083_QC401_210303,							
0083_QC302_210303,	0083_QC402_210303							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW128_210303,	0083_SW120_210303,	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
0083_QC301_210303,	0083_QC401_210303,							
0083_QC302_210303,	0083_QC402_210303							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_SW128_210303, 0083_SW120_210303, 0083_QC301_210303, 0083_QC401_210303, 0083_QC302_210303, 0083_QC402_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	**12.50**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	**12.50**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	16	**6.25**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

(ALS) COC#: 19810 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 3/3 1140	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SED - SC

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD128		03/03/2021 05:18 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0083_SD120		03/03/2021 06:06 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0083_QC103		03/03/2021 06:06 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2102202

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: **19810** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHA SED - SC

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD128	HDPE Soil Jar	200 mL	00620719008730	Grey	No	
001	0083_SD128	Soil Glass Jar - Unpreserved	150 mL	00260220014945	Orange	No	
002	0083_SD120	HDPE Soil Jar	200 mL	00621019018082	Grey	No	
002	0083_SD120	Soil Glass Jar - Unpreserved	150 mL	00260520053110	Orange	No	
003	0083_QC103	HDPE Soil Jar	200 mL	00621019018162	Grey	No	
003	0083_QC103	Soil Glass Jar - Unpreserved	150 mL	00260520053309	Orange	No	

Total Bottle Count: ALS: 6, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102202**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 19810	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 08-Mar-2021 11:40	Issue Date	: 08-Mar-2021
Client Requested Due Date	: 18-Mar-2021	Scheduled Reporting Date	: **18-Mar-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 6	Temperature	: 28.7
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2102202-001	03-Mar-2021 17:18	0083_SD128_210303	✓	✓	✓	✓
EP2102202-002	03-Mar-2021 18:06	0083_SD120_210303	✓	✓	✓	✓
EP2102202-003	03-Mar-2021 18:06	0083_QC103_210303	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2102202**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021 11:40
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19810	Issue Date	: 18-Mar-2021 16:48
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD128_210303	0083_SD120_210303	0083_QC103_210303	----	----
			Sampling date / time	03-Mar-2021 17:18	03-Mar-2021 18:06	03-Mar-2021 18:06	----	----
Compound	CAS Number	LOR	Unit	EP2102202-001	EP2102202-002	EP2102202-003	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.9**	**8.4**	**8.4**	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**4610**	**5470**	**5730**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**17.3**	**25.0**	**23.8**	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**49.9**	**38.8**	**36.2**	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**4.8**	**4.1**	**3.9**	----	----
Exchangeable Potassium	----	0.1	meq/100g	<0.1	**0.2**	**0.2**	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.5**	**0.3**	**0.4**	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**55.2**	**43.4**	**40.7**	----	----
Exchangeable Sodium Percent	----	0.1	%	**0.8**	**0.8**	**0.9**	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**0.9**	**0.9**	**0.9**	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD128_210303	0083_SD120_210303	0083_QC103_210303	----	----
				Sampling date / time	03-Mar-2021 17:18	03-Mar-2021 18:06	03-Mar-2021 18:06	----	----
Compound	CAS Number	LOR	Unit		EP2102202-001	EP2102202-002	EP2102202-003	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: **SEDIMENT** (Matrix: **SOIL**)			Sample ID	0083_SD128_210303	0083_SD120_210303	0083_QC103_210303	----	----
			Sampling date / time	03-Mar-2021 17:18	03-Mar-2021 18:06	03-Mar-2021 18:06	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2102202-001**	**EP2102202-002**	**EP2102202-003**	--------	--------
				Result	Result	Result	----	----
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**----**	**----**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	**----**	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**108**	**104**	**97.5**	**----**	**----**
13C8-PFOA	----	0.0002	%	**96.5**	**93.0**	**96.0**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2102202**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19810	Issue Date	: 18-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3552761)									
EP2102192-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.5	8.7	1.63	0% - 20%
EP2102200-007	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.8	1.38	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3552760)									
EP2102192-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	66	66	0.00	0% - 20%
EP2102200-007	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	8760	9080	3.59	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3552787)									
EP2102192-001	Anonymous	EA055: Moisture Content	----	0.1	%	8.3	7.5	10.1	0% - 20%
EP2102200-007	Anonymous	EA055: Moisture Content	----	0.1	%	32.0	30.9	3.42	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3553755)									
EP2102192-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	17.9	17.4	3.07	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.4	3.2	7.26	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	21.5	20.7	3.74	0% - 20%
EP2102349-004	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.4	0.5	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	63.0	64.5	2.48	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.9	5.0	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.4	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	68.3	70.0	2.43	0% - 20%
EP004: Organic Matter (QC Lot: 3552768)									
EP2102192-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.9	1.9	0.00	No Limit
EP2102200-008	Anonymous	EP004: Organic Matter	----	0.5	%	1.2	1.3	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556278)									
EP2102192-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0012	0.0013	10.3	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2102200-008	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556278)									
EP2102192-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2102200-008	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556278)									
EP2102192-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556278) - continued									
EP2102192-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102200-008	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556278)									
EP2102192-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102200-008	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3552761)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3552760)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	12890 µS/cm	100	93.6	106
ED008: Exchangeable Cations (QCLot: 3553755)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	93.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	88.0	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	100	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	93.3	79.9	110
EP004: Organic Matter (QCLot: 3552768)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	116	70.0	120
				<0.5	85 %	83.8	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556278)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	126	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556278)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	102	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	124	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	132	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	126	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	129	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	118	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556278)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556278) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	128	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	111	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	124	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	115	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	136	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556278)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	124	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	132	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	107	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	104	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	111	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	118	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	120	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	130	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	123	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	115	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	106	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	128	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	130	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	127	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	122	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	123	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	125	69.0	133

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556278) - continued							
EP2102192-001	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	133	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	133	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	131	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	118	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	126	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	118	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	121	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	130	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	124	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	122	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	119	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	122	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	121	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	101	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	136	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2102202**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/HEHA	Issue Date	: 18-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 3
Order number	: DEF19009/0083	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**09-Mar-2021**	10-Mar-2021	✓	**09-Mar-2021**	09-Mar-2021	✓
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**09-Mar-2021**	10-Mar-2021	✓	**09-Mar-2021**	06-Apr-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	17-Mar-2021	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**11-Mar-2021**	31-Mar-2021	✓	**11-Mar-2021**	31-Mar-2021	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**12-Mar-2021**	31-Mar-2021	✓	**12-Mar-2021**	31-Mar-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
0083_SD128_210303, 0083_QC103_210303	0083_SD120_210303,	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD128_210303, 0083_SD120_210303, 0083_QC103_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0083_SD128_210303, 0083_SD120_210303, 0083_QC103_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

CHAIN OF CUSTODY

(ALS) COC#: 19913 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	EG DATE TIME: 08.02.21 1140	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC DEF19009/HEHA SED

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

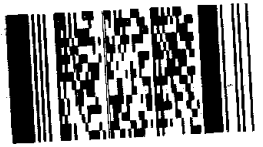
EMAIL INVOICES TO: claire.armstrong@cardno.com.au

LABORATORY USE ONLY (Circle)

Custody Seal intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comments:			

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD113		05/03/2021 09:02 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0083_SD112		05/03/2021 09:31 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2102349



Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: 19913 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD113	HDPE Soil Jar	200 mL	00620719069323	Grey	No	
001	0083_SD113	Soil Glass Jar - Unpreserved	150 mL	00260220069352	Orange	No	
002	0083_SD112	Soil Glass Jar - Unpreserved	150 mL	00260220069363	Orange	No	
002	0083_SD112	HDPE Soil Jar	200 mL	00620719069294	Grey	No	

Total Bottle Count: ALS: 4, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102349**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 19913	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 08-Mar-2021 11:40	Issue Date	: 09-Mar-2021
Client Requested Due Date	: 18-Mar-2021	Scheduled Reporting Date	: **18-Mar-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 6	Temperature	: 28.7
Receipt Detail	:	No. of samples received / analysed	: 4 / 4

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- EP231X conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **EP231X analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2102349-001	05-Mar-2021 09:02	0083_SD113_210305	✓	✓	✓	✓
EP2102349-002	05-Mar-2021 09:31	0083_SD112_210305	✓	✓	✓	✓
EP2102349-003	03-Mar-2021 00:00	0083_SD126_210303	✓	✓	✓	✓
EP2102349-004	03-Mar-2021 00:00	0083_SD127_210303	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2102349**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021 11:40
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19913	Issue Date	: 15-Mar-2021 15:32
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231X conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD113_210305	0083_SD112_210305	0083_SD126_210303	0083_SD127_210303	----
			Sampling date / time	05-Mar-2021 09:02	05-Mar-2021 09:31	03-Mar-2021 00:00	03-Mar-2021 00:00	----
Compound	CAS Number	LOR	Unit	EP2102349-001	EP2102349-002	EP2102349-003	EP2102349-004	--------
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.0**	**9.0**	**8.9**	**9.0**	**----**
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**78**	**9840**	**2220**	**9400**	**----**
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**6.4**	**40.2**	**18.8**	**20.6**	**----**
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**19.4**	**----**	**----**	**----**	**----**
Exchangeable Magnesium	----	0.1	meq/100g	**1.6**	**----**	**----**	**----**	**----**
Exchangeable Potassium	----	0.1	meq/100g	<0.1	**----**	**----**	**----**	**----**
Exchangeable Sodium	----	0.1	meq/100g	**0.3**	**----**	**----**	**----**	**----**
Cation Exchange Capacity	----	0.1	meq/100g	**21.4**	**----**	**----**	**----**	**----**
Exchangeable Sodium Percent	----	0.1	%	**1.4**	**----**	**----**	**----**	**----**
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**----**	**71.4**	**20.3**	**63.0**	**----**
Exchangeable Magnesium	----	0.1	meq/100g	**----**	**8.5**	**4.0**	**4.9**	**----**
Exchangeable Potassium	----	0.1	meq/100g	**----**	**0.9**	**0.1**	**0.1**	**----**
Exchangeable Sodium	----	0.1	meq/100g	**----**	**2.7**	<0.1	**0.3**	**----**
Cation Exchange Capacity	----	0.1	meq/100g	**----**	**83.6**	**24.6**	**68.3**	**----**
Exchangeable Sodium Percent	----	0.1	%	**----**	**3.3**	**0.3**	**0.4**	**----**
EP004: Organic Matter								
Organic Matter	----	0.5	%	**4.1**	**3.2**	**0.6**	<0.5	**----**
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**----**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**----**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0002**	<0.0002	<0.0002	<0.0002	**----**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**----**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0009**	**0.0003**	<0.0002	<0.0002	**----**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	**----**

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD113_210305	0083_SD112_210305	0083_SD126_210303	0083_SD127_210303	----
				Sampling date / time	05-Mar-2021 09:02	05-Mar-2021 09:31	03-Mar-2021 00:00	03-Mar-2021 00:00	----
Compound	CAS Number	LOR	Unit		EP2102349-001	EP2102349-002	EP2102349-003	EP2102349-004	--------
					Result	Result	Result	Result	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD113_210305	0083_SD112_210305	0083_SD126_210303	0083_SD127_210303	----
			Sampling date / time	05-Mar-2021 09:02	05-Mar-2021 09:31	03-Mar-2021 00:00	03-Mar-2021 00:00	----
Compound	CAS Number	LOR	Unit	EP2102349-001	EP2102349-002	EP2102349-003	EP2102349-004	--------
				Result	Result	Result	Result	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	**0.0012**	<0.0005	<0.0005	<0.0005	**----**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	**0.0016**	<0.0005	<0.0005	<0.0005	**----**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	**----**
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	**0.0039**	**0.0003**	<0.0002	<0.0002	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0011**	**0.0003**	<0.0002	<0.0002	**----**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0039**	**0.0003**	<0.0002	<0.0002	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**112**	**104**	**108**	**104**	**----**
13C8-PFOA	----	0.0002	%	**94.5**	**93.0**	**99.5**	**93.0**	**----**

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2102349**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19913	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3552767)									
EP2102349-001	0083_SD113_210305	EA002: pH Value	----	0.1	pH Unit	8.0	8.2	1.48	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3552766)									
EP2102349-001	0083_SD113_210305	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	78	80	2.41	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3552801)									
EP2102349-001	0083_SD113_210305	EA055: Moisture Content	----	0.1	%	6.4	7.3	13.6	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3554866)									
EP2102259-013	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	7.8	7.8	0.00	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	23.5	23.6	0.433	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	5.7	5.8	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	2.1	2.1	0.00	0% - 20%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	2.6	2.7	0.00	0% - 20%
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	33.9	34.2	0.630	0% - 20%
EP2102259-023	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	0.5	0.5	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	19.4	19.3	0.620	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.8	2.7	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.7	0.7	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	23.0	22.8	0.596	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3553755)									
EP2102192-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	17.9	17.4	3.07	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.4	3.2	7.26	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED008: Exchangeable Cations (QC Lot: 3553755) - continued									
EP2102192-002	Anonymous	ED008: Cation Exchange Capacity	----	0.1	meq/100g	21.5	20.7	3.74	0% - 20%
EP2102349-004	0083_SD127_210303	ED008: Exchangeable Sodium Percent	----	0.1	%	0.4	0.5	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	63.0	64.5	2.48	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.9	5.0	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.4	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	68.3	70.0	2.43	0% - 20%
EP004: Organic Matter (QC Lot: 3552768)									
EP2102192-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.9	1.9	0.00	No Limit
EP2102200-008	Anonymous	EP004: Organic Matter	----	0.5	%	1.2	1.3	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556700)									
EP2102261-020	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0007	0.0006	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2102349-002	0083_SD112_210305	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0003	0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556700)									
EP2102261-020	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2102349-002	0083_SD112_210305	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556700) - continued									
EP2102349-002	0083_SD112_210305	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556700)									
EP2102261-020	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102349-002	0083_SD112_210305	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556700)									
EP2102261-020	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556700) - continued									
EP2102261-020	Anonymous	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102349-002	0083_SD112_210305	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3552767)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3552766)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	147 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3554866)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	91.6	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	93.9	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	110	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	111	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	93.0	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3553755)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	93.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	88.0	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	100	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	93.3	79.9	110
EP004: Organic Matter (QCLot: 3552768)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	116	70.0	120
				<0.5	85 %	83.8	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556700)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556700)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	107	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	69.0	133

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556700) - continued								
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	125	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	126	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556700)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	108	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	116	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	120	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556700)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	124	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	116	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	113	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	102	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556700)							
EP2102261-020	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	123	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	122	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	121	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	92.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	121	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	111	59.0	134

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556700)							
EP2102261-020	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	117	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	119	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	116	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	116	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	119	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	119	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	117	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	116	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	118	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	124	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	123	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556700)							
EP2102261-020	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	117	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	117	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	120	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	124	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	112	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	118	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	116	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556700)							
EP2102261-020	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	120	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	123	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	124	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2102349**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/HEHA	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 4
Order number	: DEF19009/0083	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0083_SD126_210303,	0083_SD127_210303	**03-Mar-2021**	**09-Mar-2021**	10-Mar-2021	✓	**09-Mar-2021**	09-Mar-2021	✓
Soil Glass Jar - Unpreserved (EA002)								
0083_SD113_210305,	0083_SD112_210305	**05-Mar-2021**	**09-Mar-2021**	12-Mar-2021	✓	**09-Mar-2021**	09-Mar-2021	✓
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0083_SD126_210303,	0083_SD127_210303	**03-Mar-2021**	**09-Mar-2021**	10-Mar-2021	✓	**09-Mar-2021**	06-Apr-2021	✓
Soil Glass Jar - Unpreserved (EA010)								
0083_SD113_210305,	0083_SD112_210305	**05-Mar-2021**	**09-Mar-2021**	12-Mar-2021	✓	**09-Mar-2021**	06-Apr-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0083_SD126_210303,	0083_SD127_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	17-Mar-2021	✓
Soil Glass Jar - Unpreserved (EA055)								
0083_SD113_210305,	0083_SD112_210305	**05-Mar-2021**	**----**	----	----	**09-Mar-2021**	19-Mar-2021	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)								
0083_SD113_210305		**05-Mar-2021**	**11-Mar-2021**	02-Apr-2021	✓	**11-Mar-2021**	02-Apr-2021	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0083_SD126_210303,	0083_SD127_210303	**03-Mar-2021**	**11-Mar-2021**	31-Mar-2021	✓	**11-Mar-2021**	31-Mar-2021	✓
Soil Glass Jar - Unpreserved (ED008)								
0083_SD112_210305		**05-Mar-2021**	**11-Mar-2021**	02-Apr-2021	✓	**11-Mar-2021**	02-Apr-2021	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0083_SD126_210303,	0083_SD127_210303	**03-Mar-2021**	**12-Mar-2021**	31-Mar-2021	✓	**12-Mar-2021**	31-Mar-2021	✓
Soil Glass Jar - Unpreserved (EP004)								
0083_SD113_210305,	0083_SD112_210305	**05-Mar-2021**	**12-Mar-2021**	02-Apr-2021	✓	**12-Mar-2021**	02-Apr-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0083_SD126_210303,	0083_SD127_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
HDPE Soil Jar (EP231X)								
0083_SD113_210305,	0083_SD112_210305	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	20-Apr-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) 0083_SD126_210303, 0083_SD127_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
HDPE Soil Jar (EP231X) 0083_SD113_210305, 0083_SD112_210305	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) 0083_SD126_210303, 0083_SD127_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
HDPE Soil Jar (EP231X) 0083_SD113_210305, 0083_SD112_210305	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) 0083_SD126_210303, 0083_SD127_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
HDPE Soil Jar (EP231X) 0083_SD113_210305, 0083_SD112_210305	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) 0083_SD126_210303, 0083_SD127_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	20-Apr-2021	✓
HDPE Soil Jar (EP231X) 0083_SD113_210305, 0083_SD112_210305	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	20-Apr-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	4	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

CHAIN OF CUSTODY

COC#: 19914 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	EG DATE TIME: 08.03.21 1140	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC DEF19009/HEHA SW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Rinsate WATER	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SW113		05/03/2021 09:01 AM	Water	ALS: 6 Non ALS: 0	No		X		
002	0083_QC301		05/03/2021 09:05 AM	Water	ALS: 2 Non ALS: 0	No	X			
003	0083_QC401		05/03/2021 09:06 AM	Water	ALS: 2 Non ALS: 0	No	X			
004	0083_SW112		05/03/2021 09:30 AM	Water	ALS: 4 Non ALS: 0	No		X		

Environmental Division
Perth
Work Order Reference
EP2102350

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: **19914** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC DEF19009/HEHA SW

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PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SW113	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023595	Purple	No	
001	0083_SW113	Clear Plastic Bottle - Natural	250 mL	00071119091261	Green	No	
001	0083_SW113	HDPE (no PTFE)	20 mL	00352005006836	Grey	No	
001	0083_SW113	HDPE (no PTFE)	20 mL	00352005006825	Grey	No	
001	0083_SW113	HDPE (no PTFE)	20 mL	00350019042087	Grey	No	
001	0083_SW113	HDPE (no PTFE)	20 mL	00350019042002	Grey	No	
002	0083_QC301	HDPE (no PTFE)	20 mL	00350019035085	Grey	No	
002	0083_QC301	HDPE (no PTFE)	20 mL	00350019035087	Grey	No	
003	0083_QC401	HDPE (no PTFE)	20 mL	00350019177447	Grey	No	
003	0083_QC401	HDPE (no PTFE)	20 mL	00350019177426	Grey	No	
004	0083_SW112	Clear Plastic Bottle - Natural	250 mL	00070519143706	Green	No	
004	0083_SW112	HDPE (no PTFE)	20 mL	00350019025448	Grey	No	
004	0083_SW112	HDPE (no PTFE)	20 mL	00350019025502	Grey	No	
004	0083_SW112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011693	Purple	No	

Total Bottle Count: ALS: 14, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102350**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 19914	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 08-Mar-2021 11:40	Issue Date	: 08-Mar-2021
Client Requested Due Date	: 18-Mar-2021	Scheduled Reporting Date	: **18-Mar-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 6	Temperature	: 28.7
Receipt Detail	:	No. of samples received / analysed	: 4 / 4

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2102350-001	05-Mar-2021 09:01	0083_SW113_210305	✓	✓	✓	✓	✓	✓	✓
EP2102350-004	05-Mar-2021 09:30	0083_SW112_210305	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2102350-001	05-Mar-2021 09:01	0083_SW113_210305	✓
EP2102350-002	05-Mar-2021 09:05	0083_QC301_210305	✓
EP2102350-003	05-Mar-2021 09:06	0083_QC401_210305	✓
EP2102350-004	05-Mar-2021 09:30	0083_SW112_210305	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_SW112_21030	Clear Plastic Bottle - Natural	----	05-Mar-2021	08-Mar-2021	×	----	----
0083_SW113_21030	Clear Plastic Bottle - Natural	----	05-Mar-2021	08-Mar-2021	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2102350**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021 11:40
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19914	Issue Date	: 15-Mar-2021 15:31
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW113_210305	0083_QC301_210305	0083_QC401_210305	0083_SW112_210305	----
			Sampling date / time	05-Mar-2021 09:01	05-Mar-2021 09:05	05-Mar-2021 09:06	05-Mar-2021 09:30	----
Compound	CAS Number	LOR	Unit	EP2102350-001	EP2102350-002	EP2102350-003	EP2102350-004	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.40**	----	----	**7.33**	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**352**	----	----	**18800**	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	**8**	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**53**	----	----	**90**	----
Total Alkalinity as CaCO3	----	1	mg/L	**53**	----	----	**90**	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**90**	----	----	**2380**	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**108**	----	----	**9330**	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**48**	----	----	**685**	----
Magnesium	7439-95-4	1	mg/L	**6**	----	----	**534**	----
Sodium	7440-23-5	1	mg/L	**76**	----	----	**5120**	----
Potassium	7440-09-7	1	mg/L	**5**	----	----	**291**	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**5.98**	----	----	**314**	----
ø Total Cations	----	0.01	meq/L	**6.32**	----	----	**308**	----
ø Ionic Balance	----	0.01	%	**2.79**	----	----	**1.00**	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**51**	----	----	**33**	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**0.14**	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW113_210305	0083_QC301_210305	0083_QC401_210305	0083_SW112_210305	----
				Sampling date / time	05-Mar-2021 09:01	05-Mar-2021 09:05	05-Mar-2021 09:06	05-Mar-2021 09:30	----
Compound	CAS Number	LOR	Unit		EP2102350-001	EP2102350-002	EP2102350-003	EP2102350-004	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.21**	<0.01	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.95**	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.54**	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.35**	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.12**	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.05**	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW113_210305	0083_QC301_210305	0083_QC401_210305	0083_SW112_210305	----
				Sampling date / time	05-Mar-2021 09:01	05-Mar-2021 09:05	05-Mar-2021 09:06	05-Mar-2021 09:30	----
Compound	CAS Number	LOR	Unit		EP2102350-001	EP2102350-002	EP2102350-003	EP2102350-004	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**1.98**	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**0.43**	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**4.77**	<0.01	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.35**	<0.01	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**4.72**	<0.01	<0.01	<0.01	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**93.4**	**106**	**91.5**	**84.3**	----
13C8-PFOA	----	0.02	%		**88.3**	**95.2**	**94.8**	**92.4**	----

Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2102350**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19914	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

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Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3553100)									
EP2102258-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.14	0.988	0% - 20%
EP2102352-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.11	0.618	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3560018)									
EP2102350-001	0083_SW113_210305	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	352	380	7.78	0% - 20%
EP2102480-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6070	6090	0.296	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3560019)									
EP2102350-001	0083_SW113_210305	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3553099)									
EP2102258-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	85	86	1.33	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	85	86	1.33	0% - 20%
EP2102352-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	102	109	7.01	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	102	109	7.01	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3551447)									
EP2102258-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	12	12	0.00	0% - 50%
EP2102258-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1950	1900	3.03	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3551448)									
EP2102258-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19	19	0.00	0% - 50%
EP2102258-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	12700	13100	3.05	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3552544)									
EP2102258-012	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	386	397	2.74	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3552544) - continued									
EP2102258-012	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	706	726	2.83	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5710	5880	2.85	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	337	347	2.85	0% - 20%
EP2102350-001	0083_SW113_210305	ED093F: Calcium	7440-70-2	1	mg/L	48	48	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	76	76	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3553745)									
EP2102201-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	7	7	0.00	No Limit
EP2102258-011	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	8	9	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556555)									
EP2102350-001	0083_SW113_210305	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.21	0.23	6.00	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.14	0.13	8.41	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556555)									
EP2102350-001	0083_SW113_210305	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.12	0.11	0.00	0% - 50%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.95	0.92	3.29	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.54	0.51	4.88	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.35	0.34	0.00	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.05	0.05	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556555)									
EP2102350-001	0083_SW113_210305	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556555) - continued									
EP2102350-001	0083_SW113_210305	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556555)									
EP2102350-001	0083_SW113_210305	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	1.98	1.79	10.5	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	0.43	0.44	3.67	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3556555)									
EP2102350-001	0083_SW113_210305	EP231X: Sum of PFAS	----	0.01	µg/L	4.77	4.52	5.38	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3553100)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3560018)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	97.8	88.1	114
				<10	1000 mg/L	96.6	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3560019)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3553099)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	100	81.2	126
				<1	200 mg/L	93.9	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551447)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	99.2	87.7	113
				<1	500 mg/L	108	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3551448)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.5	87.9	114
				<1	1000 mg/L	97.7	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3552544)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.5	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	94.8	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.4	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.6	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	110	73.2	116
				<1	100 mg/L	109	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556555)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	117	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	112	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556555) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	106	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	118	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556555)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	98.0	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	128	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	121	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	127	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	116	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556555)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	109	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	129	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	101	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	118	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	109	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	98.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	116	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556555)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	120	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	124	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	125	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	120	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551447)							
EP2102258-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	106	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3551448)							
EP2102258-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	97.0	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)							
EP2102201-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	110	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2102350**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/HEHA	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 4
Order number	: DEF19009/0083	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0083_SW113_210305, 0083_SW112_210305	----	----	----	09-Mar-2021	05-Mar-2021	**4**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	16	6.25	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	16	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_SW113_210305, 0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**09-Mar-2021**	05-Mar-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_SW113_210305, 0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**12-Mar-2021**	12-Mar-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_SW113_210305, 0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**12-Mar-2021**	12-Mar-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_SW113_210305, 0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**09-Mar-2021**	19-Mar-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_SW113_210305, 0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**11-Mar-2021**	02-Apr-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_SW113_210305,	0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**11-Mar-2021**	02-Apr-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_SW113_210305,	0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**09-Mar-2021**	12-Mar-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_SW113_210305,	0083_SW112_210305	**05-Mar-2021**	**----**	----	----	**09-Mar-2021**	02-Apr-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW113_210305,	0083_QC301_210305,	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	01-Sep-2021	✓
0083_QC401_210305,	0083_SW112_210305							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW113_210305,	0083_QC301_210305,	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	01-Sep-2021	✓
0083_QC401_210305,	0083_SW112_210305							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_SW113_210305,	0083_QC301_210305,	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	01-Sep-2021	✓
0083_QC401_210305,	0083_SW112_210305							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW113_210305,	0083_QC301_210305,	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	01-Sep-2021	✓
0083_QC401_210305,	0083_SW112_210305							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_SW113_210305,	0083_QC301_210305,	**05-Mar-2021**	**11-Mar-2021**	01-Sep-2021	✓	**11-Mar-2021**	01-Sep-2021	✓
0083_QC401_210305,	0083_SW112_210305							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	**11.11**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	**5.56**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	16	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ Sydney Laboratory — Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2066 — 02 9900 8400 — EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory — Unit 1.21 Smallwood Place Murarrie QLD 4172 — 07 3902 4600 — EnviroSampleQLD@eurofins.com

☐ Perth Laboratory — Unit 7 6-10 Hasler Way Newburn WA 6126 — 08 6253 4444 — EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory — 6 Monterey Road Dandenong South VIC 3175 — 03 8564 5000 — EnviroSampleVIC@eurofins.com

Company	CARDNO	Project №	WA_0082_PFASOMP	Project Manager	David James
Address	11 harvest Tce WEST PERTH	Project Name	HEH-A	EDD Format (ESdat, EQuIS etc)	ESdat
Contact Name	Maelle Bourdais			Sampler(s)	Ashley Brown
Phone №	0448 308 372			Handed over by	ALS
Special Directions	Please send ESdat report to derp.labreports@esdat.com.au with the project No in the header file.			Email for Invoice	claire.armstrong@cardno.com.au
Purchase Order	DEF19009/530			Email for Results	maelle.bourdais@cardno.com.au derp.labreports@esdat.com.au
Quote ID №					

Analytes (Where metals are required, please specify "Total" or "Filtered". SUITE code must be used to arrive SUITE pricing)

№	Client Sample ID	Sampled Date/Time (dd/mm/yy hh:mm)	Matrix Solid (S) Water (W)	Full PFAS suite	(water) Major anions & cations	(water) DOC, TSS, TDS, pH	(sediment) TOC, CEC, pH
1	0083_QC203-B0a210303	3/3/21	S	X			X
2	0083-QC204-210303	3/3/21	W	X	X	X	
3							
4							
5							
6							
7							
8							
9							
10							
	Total Counts						

779272-Ma18443 ↓ Ma18444

Containers (Change container type & size if necessary)

500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)

Required Turnaround Time (TAT) (Overnight for Perth only)

- ☐ Overnight (reporting by 9am♦)
- ☐ Same day♦ ☐ 1 day♦
- ☐ 2 days♦ ☐ 3 days♦
- ☒ 5 days (Standard)
- ☐ Other

♦Surcharge will apply

Sample Comments / Dangerous Goods Hazard Warning

Method of Shipment: ☑ Courier (#) ☐ Hand Delivered ☐ Postal — Name: Ashley Brown — Signature: — Date: 4/3/21 — Time:

Laboratory Use Only								
Received By	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date		Time		Temperature
Received By	SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date		Time		Report № 779429

Eurofins Environment Testing Australia Pty Ltd

Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request

eurofins | Environment Testing

ABN: 50 005 085 521 www.eurofins.com.au EnviroSales@eurofins.com

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Site # 1254 & 14271

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

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New Zealand

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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name:	Cardno (WA)
Contact name:	Maelle Bourdais
Project name:	HEH-A
Project ID:	WA_0082_PFASOMP
Turnaround time:	5 Day
Date/Time received	Mar 8, 2021 11:30 AM
Eurofins reference	779429

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Rhys Thomas on phone : (+61) 8 9251 9602 or by email: RhysThomas@eurofins.com

Results will be delivered electronically via email to Maelle Bourdais - Maelle.Bourdais@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (WA) email address.

eurofins | Environment Testing

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

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Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name:	Cardno (WA)	**Order No.:**	DEF19009/415/240	**Received:**	Mar 8, 2021 11:30 AM
Address:	11 Harvest Terrace West Perth WA 6005	**Report #:**	779429	**Due:**	Mar 17, 2021
		Phone:	08 9273 3888	**Priority:**	5 Day
		Fax:	08 9388 3831	**Contact Name:**	Maelle Bourdais
Project Name:	HEH-A				
Project ID:	WA_0082_PFASOMP				

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**											
1	0083_QC203_210303	Mar 03, 2021		Soil	M21-Ma18443		X		X		X	X		X		
2	0083_QC204_210303	Mar 03, 2021		Water	M21-Ma18444	X		X		X			X	X	X	X
Test Counts						1	1	1	1	1	1	1	1	2	1	1

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection and proficiency testing scheme providers reports.

Attention: **Maelle Bourdais**

Report **779272-W-V2**
Project name HEH-B
Project ID WA_0082_PFASOMP
Received Date Mar 08, 2021

Client Sample ID			**0082_QC201_210303**
Sample Matrix			**Water**
Eurofins Sample No.			**M21-Ma18441**
Date Sampled			**Mar 03, 2021**
Test/Reference	LOR	Unit	
Dissolved Organic Carbon	5	mg/L	11
pH (at 25 °C)	0.1	pH Units	8.2
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	55000
Total Suspended Solids Dried at 103–105°C	1	mg/L	28
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	94
13C5-PFPeA (surr.)	1	%	85
13C5-PFHxA (surr.)	1	%	99
13C4-PFHpA (surr.)	1	%	105
13C8-PFOA (surr.)	1	%	104
13C5-PFNA (surr.)	1	%	109
13C6-PFDA (surr.)	1	%	90
13C2-PFUnDA (surr.)	1	%	115
13C2-PFDoDA (surr.)	1	%	123
13C2-PFTeDA (surr.)	1	%	128
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05

Client Sample ID			0082_QC201_210303
Sample Matrix			**Water**
Eurofins Sample No.			**M21-Ma18441**
Date Sampled			**Mar 03, 2021**
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	130
D3-N-MeFOSA (surr.)	1	%	107
D5-N-EtFOSA (surr.)	1	%	128
D7-N-MeFOSE (surr.)	1	%	109
D9-N-EtFOSE (surr.)	1	%	103
D5-N-EtFOSAA (surr.)	1	%	83
D3-N-MeFOSAA (surr.)	1	%	79
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	112
18O2-PFHxS (surr.)	1	%	116
13C8-PFOS (surr.)	1	%	131
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01
13C2-4:2 FTS (surr.)	1	%	120
13C2-6:2 FTSA (surr.)	1	%	162
13C2-8:2 FTSA (surr.)	1	%	116
13C2-10:2 FTSA (surr.)	1	%	120
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	0.3
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.25
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.31
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.31
Sum of PFASs (n=30)*	0.1	ug/L	0.31

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Dissolved Organic Carbon	Melbourne	Mar 12, 2021	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Melbourne	Mar 12, 2021	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Mar 12, 2021	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Mar 12, 2021	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins | Environment Testing

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Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: HEH-B
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/415/240
Report #: 779272
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 16, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Per- and Polyfluoroalkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X		X
Sydney Laboratory - NATA Site # 18217														
Brisbane Laboratory - NATA Site # 20794													X	
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory														
External Laboratory														
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**									
1	0082_QC201_210303	Mar 03, 2021		Water	M21-Ma18441	X		X		X			X	X
2	0082_QC202_210303	Mar 03, 2021		Soil	M21-Ma18442		X		X		X	X	X	
Test Counts						1	1	1	1	1	1	1	2	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Total Dissolved Solids Dried at 180°C ± 2°C	%	94			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	108			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	120			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	101			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	99			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	95			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	103			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorononanoic acid (PFNA)	%	98			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	92			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	105			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	102			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	92			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	94			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	97			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	90			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	81			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	86			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	81			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	101			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	118			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	87			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	95			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	91			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	97			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	89			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	100			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	97			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	87			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	93			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	93			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	97			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103–105°C	M21-Ma21540	NCP	%	90			70-130	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	S21-Ma20619	NCP	%	103			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S21-Ma20619	NCP	%	101			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S21-Ma20619	NCP	%	100			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S21-Ma20619	NCP	%	98			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S21-Ma20619	NCP	%	102			50-150	Pass	
Perfluorononanoic acid (PFNA)	S21-Ma20619	NCP	%	103			50-150	Pass	
Perfluorodecanoic acid (PFDA)	S21-Ma20619	NCP	%	104			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S21-Ma20619	NCP	%	105			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S21-Ma20619	NCP	%	100			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	S21-Ma20619	NCP	%	122			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S21-Ma20619	NCP	%	89			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctane sulfonamide (FOSA)	S21-Ma20619	NCP	%	106			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S21-Ma20619	NCP	%	95			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S21-Ma20619	NCP	%	83			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S21-Ma20619	NCP	%	90			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S21-Ma20619	NCP	%	81			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S21-Ma20619	NCP	%	101			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S21-Ma20619	NCP	%	106			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S21-Ma20619	NCP	%	89			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S21-Ma20619	NCP	%	88			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S21-Ma20619	NCP	%	85			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S21-Ma20619	NCP	%	99			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S21-Ma20619	NCP	%	95			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S21-Ma20619	NCP	%	104			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S21-Ma20619	NCP	%	109			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S21-Ma20619	NCP	%	64			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S21-Ma20619	NCP	%	96			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S21-Ma20619	NCP	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S21-Ma20619	NCP	%	99			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S21-Ma20619	NCP	%	85			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
pH (at 25 °C)	M21-Ma19002	NCP	pH Units	7.1	7.0	pass	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	M21-Ma22985	NCP	mg/L	2200	2200	3.3	30%	Pass	
Total Suspended Solids Dried at 103–105°C	S21-Ma17714	NCP	mg/L	160	140	9.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S21-Ma20618	NCP	ug/L	0.02	0.02	2.0	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S21-Ma20618	NCP	ug/L	0.01	< 0.01	7.0	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorononanoic acid (PFNA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanoic acid (PFDA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	S21-Ma20618	NCP	ug/L	0.10	0.10	5.0	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	S21-Ma20618	NCP	ug/L	0.06	0.06	2.0	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S21-Ma20618	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S21-Ma20618	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments

V2 report issued with repeat results for PFOS, PFHxs and PFOA for Ma18441.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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WA 6005

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Attention: **Maelle Bourdais**

Report **779429-S**
Project name HEH-A
Project ID WA_0082_PFASOMP
Received Date Mar 08, 2021

Client Sample ID			**0083_QC203_210303**
Sample Matrix			**Soil**
Eurofins Sample No.			**M21-Ma18443**
Date Sampled			**Mar 03, 2021**
Test/Reference	LOR	Unit	
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	4400
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	7.2
Total Organic Carbon	0.1	%	1.2
% Moisture	1	%	26
Cation Exchange Capacity			
Cation Exchange Capacity	0.05	meq/100g	140
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	62
13C5-PFPeA (surr.)	1	%	89
13C5-PFHxA (surr.)	1	%	84
13C4-PFHpA (surr.)	1	%	45
13C8-PFOA (surr.)	1	%	57
13C5-PFNA (surr.)	1	%	59
13C6-PFDA (surr.)	1	%	74
13C2-PFUnDA (surr.)	1	%	86
13C2-PFDoDA (surr.)	1	%	83
13C2-PFTeDA (surr.)	1	%	104
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5

Client Sample ID			0083_QC203_210303
Sample Matrix			**Soil**
Eurofins Sample No.			**M21-Ma18443**
Date Sampled			**Mar 03, 2021**
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	103
D3-N-MeFOSA (surr.)	1	%	85
D5-N-EtFOSA (surr.)	1	%	114
D7-N-MeFOSE (surr.)	1	%	91
D9-N-EtFOSE (surr.)	1	%	86
D5-N-EtFOSAA (surr.)	1	%	76
D3-N-MeFOSAA (surr.)	1	%	72
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	80
18O2-PFHxS (surr.)	1	%	79
13C8-PFOS (surr.)	1	%	116
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5
13C2-4:2 FTS (surr.)	1	%	21
13C2-6:2 FTSA (surr.)	1	%	28
13C2-8:2 FTSA (surr.)	1	%	47
13C2-10:2 FTSA (surr.)	1	%	86
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Conductivity (1:5 aqueous extract at 25°C as rec.)	Melbourne	Mar 12, 2021	7 Days
- Method: LTM-INO-4030 Conductivity			
Cation Exchange Capacity	Melbourne	Mar 17, 2021	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage			
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Mar 12, 2021	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Total Organic Carbon	Melbourne	Mar 15, 2021	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
% Moisture	Melbourne	Mar 10, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Mar 10, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Mar 10, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Mar 17, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Mar 17, 2021	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/415/240
Report #: 779429
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Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 17, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**											
1	0083_QC203_210303	Mar 03, 2021		Soil	M21-Ma18443		X		X		X	X		X		
2	0083_QC204_210303	Mar 03, 2021		Water	M21-Ma18444	X		X		X			X	X	X	X
Test Counts						1	1	1	1	1	1	1	1	2	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Cation Exchange Capacity							
Cation Exchange Capacity	meq/100g	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Total Organic Carbon	%	101			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	103			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	112			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	106			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	101			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctanoic acid (PFOA)	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	114			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	94			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	109			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	112			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	113			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	134			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	98			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	117			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	115			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	99			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	110			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	111			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	105			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	86			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	99			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	96			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	80			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	100			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	104			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	103			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	110			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	99			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	73			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	123			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	75			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M21-Ma18446	NCP	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M21-Ma18446	NCP	%	106			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M21-Ma18446	NCP	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-Ma18446	NCP	%	103			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M21-Ma18446	NCP	%	108			50-150	Pass	
Perfluorononanoic acid (PFNA)	M21-Ma18446	NCP	%	122			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M21-Ma18446	NCP	%	94			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M21-Ma18446	NCP	%	111			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M21-Ma18446	NCP	%	111			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M21-Ma18446	NCP	%	115			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M21-Ma18446	NCP	%	108			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M21-Ma18446	NCP	%	107			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-Ma18446	NCP	%	97			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-Ma18446	NCP	%	101			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-Ma18446	NCP	%	88			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-Ma18446	NCP	%	93			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-Ma18446	NCP	%	119			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-Ma18446	NCP	%	112			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M21-Ma18446	NCP	%	91			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M21-Ma18446	NCP	%	106			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M21-Ma18446	NCP	%	110			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M21-Ma18446	NCP	%	92			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M21-Ma18446	NCP	%	103			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M21-Ma18446	NCP	%	96			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M21-Ma18446	NCP	%	128			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M21-Ma18446	NCP	%	98			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-Ma18446	NCP	%	82			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-Ma18446	NCP	%	115			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-Ma18446	NCP	%	112			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-Ma18446	NCP	%	75			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	M21-Ma18134	NCP	uS/cm	280	290	3.8	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	M21-Ma18134	NCP	pH Units	7.1	7.1	pass	30%	Pass	
Total Organic Carbon	S21-Ma24740	NCP	%	1.3	1.1	17	30%	Pass	
% Moisture	M21-Ma18132	NCP	%	4.3	4.7	8.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorononanoic acid (PFNA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S21-Ma25387	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S21-Ma25387	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S21-Ma25387	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S21-Ma25387	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Site	Location ID	Date	Sample ID	Sampling Method	Sample Depth (m)	WaterBody Depth (m)	Flow Rate	Comments/QC	Temperature C	DO (mg/L)	EC (us/Cm)	pH	Eh (mV)	Water Colour	Turbidity
Harold E Holt Area A	SW128	3/03/2021	0083_SW128_210303	Direct into Bottle	2	2	Slow	Rain yesterday	30.3	4.6	18145	8.14	113.6	Clear	Low
Harold E Holt Area A	SW127	3/03/2021	0083_SW127_210303	Direct into Bottle	0.1	0.3	Slow	QC104/204	30.8	2.98	15376	8.01	82.1	Clear	Low
Harold E Holt Area A	SW126	3/03/2021	0083_SW126_210303	Direct into Bottle				Dry							
Harold E Holt Area A	SW120	3/03/2021	0083_SW120_210303	Direct into Bottle	0.15	0.15	Slow		27.4	2.7	18663	7.7	113.4	Clear	Low
Harold E Holt Area A	SW113	5/03/2021	0083_SW113_210305	Direct into Bottle	0.15	0.4		Sampled from metal overflow pit	25.1	3.07	1120	8.58	120.4	Yellow	Medium
Harold E Holt Area A	SW112	5/03/2021	0083_SW112_210305	Direct into Bottle	1	2	Slow		26.4	2.11	27607	7.38	1422	Clear	Low

Site	Monitoring Location	Date	Sample ID	Depth of Sediment Sampling (m)	Sampling Method	Sample Condition	Sample Description	QC
Harold E Holt Area A	SD127	3/03/21	0083_SD127_210303	0.1	Shovel Trowel	Wet	Orange clay	
Harold E Holt Area A	SD128	3/03/21	0083_SD128_210303	2	Direct into Bottle	Wet	Yellow/white, salty, med sand/shell	
Harold E Holt Area A	SD126	3/03/21	0083_SD126_210303	0	Direct into Bottle	Dry	Clay	
Harold E Holt Area A	SD120	3/03/21	0083_SD120_210303	0.15	Direct into Bottle	Wet	Grey, organic, wet clay	QC103, QC203
Harold E Holt Area A	SD112	5/03/21	0083_SD112_210305	1	Direct into Bottle	Wet	Red clay	

GK Environmental EQUIPMENT

Calibration Report

Multi-Parameter Water Quality Instrument

Customer:
Contact:

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 20D101039
Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	173.40 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 57.86
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV -3 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Parameter	Standards	Reference	Calibration Point	Span	Units	Instrument Readings Before	After	Units
Temperature		Room Temp	24.6	0	°C	NA	24.6	°C
pH	pH 7.00	356684	7.01	-30.20	mV	7.04	7.01	pH
pH	pH 4.00	355385	4.00	143.20	mV	4.07	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.01	2757	2764	µs/cm
ORP (Reference check only)	Zobell A & B	20/0506	230	230	mV	237.4	232.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	0.8	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	6.58	uA	108.7	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 28-Feb-21
Next Due: 27-Aug-21

GK Environmental EQUIPMENT

Calibration Report

Multi-Parameter Water Quality Instrument

Customer:
Contact:

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 19L102399
Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	172.80 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 57.65
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV -3 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature		Room Temp	24.6	0	°C	NA	24.6	°C
pH	pH 7.00	356684	7.01	-28.80	mV	7.08	7.01	pH
pH	pH 4.00	355385	4.00	144.00	mV	4.09	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.06	2777	2764	µs/cm
ORP (Reference check only)	Zobell A & B	20/0506	230	230	mV	235.5	232.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	0.4	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	6.51	uA	99	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 28-Feb-21
Next Due: 27-Aug-21

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review
PFAS Ongoing Monitoring Plan First Flush 2021 Factual Report

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
	QA Documentation
Project Quality Plan/Work Plan and Data Quality Objectives	The field investigation was carried out on the 03 & 05 March 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (PFAS OMP SAQP HEH-A, Cardno 2020) issued to the client and in general compliance with the Australian standards AS 4482.1- 2005 "*Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds";* Standards Australia 1998. AS/NZ 5667:1998 *Water quality – sampling* and NEPM "*National Environment Protection (Assessment of Site Contamination) Measure".* A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (First Flush 2021 Sampling Event Factual Report). In addition, a safety, health and environment work method statement (SHEWMS) was also prepared. The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.
	Data Representativeness
Use of Composites	No Composites were used during the investigation
Holding Times	Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes. with the exception of the following: **Surface water:** • pH – generally 4 to 5 days overdue **Sediment:** • No holding time outliers exist The holding time exceedances for pH are due to the Site's remoteness and are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.
Verification of field procedures	The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP. Non-disposable equipment was decontaminated between sample locations.

<table>
<tr><th>QA/QC Aspects</th><th>Evidence & Evaluation</th></tr>
<tr><td colspan="2">Data Precision & Accuracy</td></tr>
<tr><td>QC sample Frequency</td><td>
<table>
<tr><th>QC sample type</th><th>SAQP required frequency</th><th>Sample Collected</th></tr>
<tr><td>Blind duplicate</td><td>1 in 10 primary samples (10%)</td><td>1 for 5 primary water samples (20%)
1 for 6 primary sediment samples (16.7%)</td></tr>
<tr><td>Split duplicate</td><td>1 in 10 primary samples (10%)</td><td>1 for 5 primary water samples (20%)
1 for 6 primary sediment samples (16.7%)</td></tr>
<tr><td>Rinsate</td><td>1 per day per YSI</td><td>3 for 2 days (100%)</td></tr>
<tr><td>Field Blank</td><td>1 per day per sampler</td><td>3 for 2 days (100%)</td></tr>
</table>
</td></tr>
<tr><td>QC Testing – Blind Replicates (Primary Lab)</td><td>
▪ RPD Acceptance Criteria:
<table>
<tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr>
<tr><td>< 10 x LOR</td><td>No limits</td></tr>
<tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr>
<tr><td>> 20 x LOR</td><td>0% - 20%</td></tr>
</table>
Surface water
▪ Number of Primary Samples Analysed: 5
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 0%
Sediment
▪ Number of Primary Samples Analysed: 6
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 0%
No RPD exceedances were reported.
</td></tr>
<tr><td>QC Testing – Field Splits (Secondary Lab)</td><td>
▪ RPD Acceptance Criteria:
<table>
<tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr>
<tr><td>< 10 x LOR</td><td>No limits</td></tr>
<tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr>
<tr><td>> 20 x LOR</td><td>0% - 20%</td></tr>
</table>
Surface water
▪ Number of Primary Samples Analysed: 5
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 2.5%
Sediment
▪ Number of Primary Samples Analysed: 6
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 3.0%
The level of RPD is insignificant. The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference or methodologies between the primary and secondary laboratories.
</td></tr>
<tr><td>Field Blanks</td><td>Field Blanks were collected at a rate of one per sampler per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.</td></tr>
<tr><td>Laboratory Internal QC</td><td>Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and satisfactory results for method blank, laboratory control samples and surrogate recovery outliers.</td></tr>
</table>

QA/QC Aspects	Evidence & Evaluation
	All Duplicates reported RPDs within the acceptance range of 0% to 20%. All Matrix Spikes generally reported recoveries within the acceptance range of 70% to 130% with the exception of the following: • EP2102194, EP2102201 o Sulfate as SO4, Chloride. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. Quality Control sample frequency was generally within the accepted rate with the exception of the following: • EP2102194, EP2102201 o PFAS. Duplicate sample frequency Actual Rate (5.26%) < Expected rate (10%) • EP2102350 o PFAS. Duplicate sample frequency Actual Rate (6.25%) < Expected rate (10%) o PFAS. MS sample frequency Actual rate (0.00%) < Expected Rate (5%)
Laboratory Method Detection Limit	Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria. However, the PFAS NEMP Ecological criteria for 99% species protection for PFOS is below the LOR. In accordance with the HEPA (2020) guideline, the LOR was adopted in this instance.
NATA endorsement of laboratory reports	Laboratory reports were stamped with the NATA endorsement stamp and signature. ALS Accreditation No. 825 Eurofins Accreditation No. 1261
Calibration of Field Equipment	All equipment used during the investigation was calibrated by the supplier prior to use. The equipment calibration certificates are provided in Appendix D.
Decontamination and Equipment Blanks	Rinsate blanks were collected at a rate of one per day each non dedicated water quality meter (YSI) used. All rinsate samples tested reported analytes concentrations below the laboratory LORs.
	Data Comparability
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
	Data Completeness
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- A factual report of the condition of a portion of the site or one aspect of an entire site.
- Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- Validation of the success of remediation of a site or a portion of a site.
- Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide "environmental sign-off" of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants' duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the "hot spot" method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

PFAS OMP Biannual Monitoring Event Factual Report

June 2021

Naval Communication Station Harold E Holt Area A

Prepared for

Department of Defence

10 August 2021

Cardno®

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Senior Environmental Engineer

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Principal/Regional WA Project Manager

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
0.0	9/07/2021	Internal Draft	MB	DJ
0	13/07/2021	External draft (Client review)	MB	DJ
1	10/08/2021	Rev 1	MB	DJ

Table of Contents

Appendices

Tables

Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl Substances
PFHxS	Per-fluoro-hexane Sulphonate
PFOA	Per-fluoro-octanoic Acid
PFOS	Per-fluoro-octane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TOC	Total Organic Carbon
TSS	Total Suspended Solids

Technical Terms

AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
BGL	Below Ground Level
COC	Chain of Custody
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

HEH-A	Naval Communication Station Harold E Holt Area A
OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence ("the Client") to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) biannual sampling event at the Naval Communication Station Harold E Holt - Area A ("HEH-A" or "the Site"). The Site is situated at the end of the North West Cape of WA, at the northern edge of Exmouth (Figure 1, Appendix A).

The OMP was carried out in accordance with the scope and limitations presented in Cardno's Sampling and Analysis Quality Plan (SAQP):

> Cardno, 14 June 2021, Reference: DEF19009, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt A'*.

The SAQP was reviewed and updated prior to the monitoring event.

For the purposes of this report:

> "the Site" was defined as Harold E Holt – Area A.

> "the Management Area" was defined as comprising the Site, plus the land extending to the Exmouth Gulf (to the east, north and north-west) The Monitoring Area is presented on Figure 2, Appendix A.

1.2 Purpose & Objectives

The objective of the OMP is to assess the changes in the nature and extent of PFAS within the environment, specifically where there is an identified potentially elevated risk to a receptor or a potential future risk to a receptor associated with Defence's historical use of legacy Aqueous Film Forming Foam (AFFF).

The purpose of this PFAS OMP factual report is to provide an up-to-date status of the condition of the site as it is currently understood in relation to the most recent sampling event.

The objectives of the report are:

> To provide a succinct summary of the June 2021 sampling event and provision of analytical results with supporting tables and figures.

> To provide confirmation of the current understanding of risk.

> To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

This assessment has been undertaken in general accordance with applicable industry standards for a site investigation for the purpose, objectives and scope identified in this report. These standards are set out in:

> National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).

> Heads of Environmental Protection Authority's Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.

> Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds.

> Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.

> Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

> Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites[1].

> Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.

> U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.

> USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

> National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

Cardno carried out the tasks detailed in the following sections in order to satisfy the purpose and objectives of this assessment.

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The groundwater bores monitored as part of the OMP are presented in Table 2-1, and are shown on Figure 4, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
Powerhouse	0083_MW017; 0083_MW027; 0083_MW213; 0083_MW214; 0083_MW104; 0083_MW101; 0083_MW102; 0083_MW103; 0083_MW019; 0083_MW123
Fuel Farm	0083_MW119; 0083_MW105; 0083_MW003; 0083_MW008; 0083_MW212; 0083_MW210
Powerhouse pathway	0083_MW218; 0083_MW117; 0083_MW217; 0083_MW116; 0083_MW115; 0083_MW114; 0083_MW113
Fuel farm pathway	0083_MW109; 0083_MW112; 0083_MW110; 0083_MW202; 0083_MW107; 0083_MW111
Broader area	0083_MW134; 0083_MW130; 0083_MW129

2.2 Seepage Water Monitoring

Sampling of selected seepage water monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The seepage water locations monitored as part of the OMP are presented in Table 2-2 and are shown on Figure 4, Appendix A.

Table 2-2 Seepage Water Monitoring Locations

Monitoring Area	Location ID
Powerhouse pathway	0083_OTH108; 0083_OTH107; 0083_OTH106; 0083_OTH105
Fuel farm pathway	0083_OTH101; 0083_OTH104; 0083_OTH103
Broader area	0083_OTH113; 0083_OTH110; 0083_OTH109; 0083_OTH102
Murat Pier salt water discharge water	0083_OTH002

[1] It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site private properties and waterways.

2.3 Surface water Monitoring

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The surface water locations monitored as part of the OMP are presented in Table 2-3 and are shown on Figure 4, Appendix A.

Table 2-3 Surface water Monitoring Locations

Monitoring Area	Location ID
Broader area	0083_SW126; 0083_SW128; 0083_SW120; 0083_SW112; 0083_SW127
Powerhouse	0083_SW113

2.4 Sediment Monitoring

Sampling of selected sediment monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The sediment locations monitored as part of the OMP are presented in Table 2-4 and are shown on Figure 5, Appendix A.

Table 2-4 Sediment Monitoring Locations

Monitoring Area	Location ID
Broader area	0083_SD126, 0083_SD128, 0083_SD120, 0083_SD112, 0083_SD127
Powerhouse	0083_SD113

2.5 Data Management

All the data included in the Report has been collected, uploaded to the ESdat database and reviewed according to the data management requirements of the Defence Contamination Management Manual (DCMM) Annex L.

The sample naming convention detailed in the DCMM Annex L was used in the field.

2.5.1 Defence ESdat database

Data collected as part of the June 2021 OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- All field data collected was uploaded;
- Laboratory data was uploaded and approved; and
- QA/QC data was reconciled.

2.6 Deviations from the OMP SAQP

Deviations from the SAQP (Cardno, 2021) for the June 2021 monitoring event are presented in Table 2-5.

Table 2-5 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
MW123	Not sampled	Access denied due to Base activities.
SW126	Not sampled	This surface water monitoring location was found dry
MW101, MW213	Dissolved organic carbon (DOC) not analysed	Insufficient amount of water to filter and fill DOC vial
MW129	DOC not analysed	Total organic carbon (TOC) analysed instead. Sample not field filtered due to high turbidity.
MW214	Non-PFAS analytes not analysed	Insufficient amount of water to collect all sampling bottles.

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken applying the methods detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) were gauged using an interface probe. All wells were measured against a specified mark at the top of the well casing.
Groundwater Field Parameters	Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records. All field instruments (e.g. water quality meter) were calibrated by the equipment supplier and bump tested daily to optimise the accuracy of the measurements taken. Calibration certificates are provided in Appendix D.
Deployment and Retrieval of HydraSleeves (single level well sample collection)	HydraSleeve were deployed with top weight sample collection to begin at the lowest point. HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment. Samples were collected via continuous pull method at a rate allowing the water to pass through the check value into the sample sleeve. Samples were discharged immediately (minimise changes in chemistry) via discharge tube. Following sampling, hydrasleeves were deployed in preparation for the next OMP monitoring event using the same string for consistency between events (same depth of sampling i.e. within screen).
Peristaltic pump (multi-level well sample collection)	The shallowest (non-dry) wells were sampled at each multi-level well location using Teflon-free dedicated and disposable high-density polyethylene (HDPE) tubing coupled to a peristaltic pump system. The groundwater was purged at a low flow rate of 0.2 L/min. SWL and field parameters were measured during purging and post sample collection to ensure limited drawdown effects. The groundwater was sampled when the field parameters had stabilised.
Decontamination procedure	Dedicated HydraSleeves/tubing were used at each groundwater bore thus removing the need for decontamination. All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample was labelled with the sample location, date, project identification number and sampler's initials. Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation. Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	Groundwater samples were submitted for the following analysis:

Activity	Details
	▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance)., dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix D.
Laboratory Testing – Quality Control	Groundwater QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory. ▪ Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)]. ▪ Field blank samples at 1 per day.

3.2 Seepage Water Sampling Methodology

Seepage water monitoring procedure is detailed in Table 3-2.

Table 3-2 Seepage water Sampling method

Activity	Details
Field parameters	The following field parameters were recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.
Sampling Method	Sampling was carried out in a two-hour period; one hour each side of the low tide. Sampling protocol involved a shallow excavation in the beach sand; just above where inundation by wave action is occurring. Sampling containers were lowered into the exposed seepage water and filled.
Decontamination procedure	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample was labelled with the sample location, date, project identification number and sampler's initials. Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation. Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	Seepage water samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance), DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	Seepage water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples.

Activity	Details
	▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.3 Surface Water Sampling Methodology

Surface water monitoring procedure is detailed in Table 3-3.

Table 3-3 Surface water Sampling Method

Activity	Details
Field parameters	The following field parameters were recorded using a water quality meter: ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.
Sampling Method	Surface water samples were collected directly into sample containers using a 'Grab' (manual) sample method via a long handled sampling device. Where depth permits, the sample container was positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films.
Decontamination procedure	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	Each sample was labelled with the sample location, date, project identification number and sampler's initials. Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation. Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	Surface water samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance), DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	Surface water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.4 Sediment Sampling Methodology

Sediment sampling methodology is detailed in Table 3-4.

Table 3-4 Sediment Sampling Method

Activity	Details
Sample Collection	Sediment samples were collected at the sediment/water interface using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under CoC documentation. At each sampling location, the sediment sample was visually assessed and observations (including physical description) recorded on field data sheets.
Field Records	The following information was recorded on the field data sheets: ▪ Sampling time, date and name of the sampler. ▪ Weather conditions. ▪ Sample Collection method. ▪ Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.
Decontamination	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Laboratory Testing	Sediment samples were submitted for the following analysis: ▪ Full PFAS analytical suite (refer to the SAQP for full list of analytes). ▪ Total Organic Carbon (TOC), Electrical Conductivity (EC), Cation Exchange Capacity (CEC) and pH
Laboratory Testing – Quality Control	Sediment QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021): ▪ Field duplicate (intra-laboratory) samples at 1 per 10 sediment samples or 1 per batch if the batch is less than 10 samples. ▪ Field triplicate (inter-laboratory) samples at 1 per 10 sediment samples and sent to a secondary laboratory.

3.5 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

> QA documentation.

> Bias.

> Data Representativeness.

> Data Precision & Accuracy.

> Laboratory Performance.

> Data Comparability.

> Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E.

The QA/QC review concluded that there are no significant systematic errors in the data collection process and therefore, the dataset used for the assessment is considered valid and complete.

3.6 Assessment Criteria

3.6.1 Groundwater, Seepage water and surface water

The adopted assessment criteria for groundwater are detailed in Table 3-5.

Table 3-5 Criteria for Groundwater, Seepage water and surface water

Exposure Scenario	Adopted Assessment Criteria PFHxS / PFOS µg/L	PFOA µg/L	Guidance
Human Health – Recreational Water	2[1]	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023[2]	19	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020).

3.6.2 Sediment

The adopted assessment criteria for sediment are detailed in Table 3-6.

Table 3-6 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria PFHxS / PFOS mg/kg	PFOA mg/kg	Guidance
Human Health - Commercial / industrial (on-base activities)	20[1]	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1[2]	10	HEPA 2020
Ecological - indirect exposure (interim guidelines)	0.01[2]	-	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only

4 Field Observations and Results

4.1 General Observations

A significant rainfall event occurred in Exmouth on the 10th June with 173.4mm of rain recorded at the Exmouth Town BoM station (No. 5051). Surface water was observed pooling in the salt pans and low-lying areas around Site which resulted in more surface water samples collected than during the June 2020 monitoring event.

4.2 Groundwater

4.2.1 Summary of Field Observations

4.2.1.1 Physicochemical parameters

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling records, included in Appendix D. Groundwater was brackish to saline (TDS ranging from 3,490 mg/L to 34,989 mg/L), near neutral (pH 6.6 to 8.3). Groundwater temperature was on average 24°C, DO readings mostly indicate aerobic groundwater condition (DO ranging from 0.55 mg/L to 5.38 mg/L). Field parameters were generally consistent with the previous monitoring events.

4.2.1.2 Groundwater Elevation and Migration

Well gauging was undertaken over two days and several tide cycles which has been considered when interpreting inferred groundwater contours and flow direction.

Groundwater elevation ranged from 0.03 mAHD (MW116) to 0.57 mAHD (MW109). Depth to groundwater was observed to range approximately between 2 meters below ground level (mbgl) and 4 mbgl.

Groundwater flow direction was interpreted to follow the site topology and be radial from the sand dunes east of site, where mounding is occurring, which is consistent with the previous monitoring events.

Groundwater elevation contours and flow direction are shown in Figure 3, Appendix A. Gauging records are presented in Appendix D.

4.2.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data in order to identify monitoring wells where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 4 in Appendix A presents the groundwater monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	0.54 (MW017)	31	0
PFOS	MW008, MW017, MW027, MW102, MW103, MW107, MW111 MW119, MW129, MW202, MW212, MW214.	0.01[3]	9.72 (MW017)	31	12
Sum of PFHxS and PFOS	MW017	2[2]	10.7 (MW017)	31	1

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

> There was no first time detect of sum of PFOS and PFHxS or PFOA or new exceedances of guideline values for the groundwater monitoring locations during June 2021.

4.3 Seepage Water

4.3.1 Summary of Field Observations

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the seepage water sampling program are presented in field sampling records, included in Appendix D. Water temperature was on average 21°C, water condition was slightly alkaline (pH 7.9 to 8.1), saline (TDS ranging from 18,798 to 36,010 mg/L) and DO readings ranging from 3.99 to 6.13 mg/L indicate aerobic conditions. Field parameters were generally consistent with the previous monitoring event.

4.3.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-2. Laboratory results have also been compared to available historical data in order to identify monitoring locations where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 4 in Appendix A presents the seepage water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Seepage water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	<0.01	12	0
PFOS	OTH113	0.01[3]	0.54 (OTH113)	12	1
Sum of PFHxS and PFOS	-	2[2]	0.56 (OTH113)	12	0

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

- There was no first-time detection of PFOA or Sum of PFOS and PFHxS at the seepage water monitoring locations during the June 2021 monitoring event.
- 11 out of 12 samples analysed reported PFAS concentrations below the laboratory LOR.

4.4 Surface water

4.4.1 Summary of Field Observations

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the surface water sampling program are presented in field sampling records, included in Appendix D. Surface water temperature was on average 16.7°C. Surface water was slightly alkaline (pH 8.02 to 8.21), fresh to hyper saline (TDS ranging from 313 to 46,800 mg/L) and DO readings indicate aerobic conditions (5,83 to 7.07 mg/L). Field parameters were generally consistent with the previous monitoring event with exception of the EC and TDS readings, likely related to the recent heavy rainfall.

4.4.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-3. Laboratory results have also been compared to available historical data in order to identify monitoring locations where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 4 in Appendix A presents the surface water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-3 Summary of Surface water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	0.07 (SW113)	5	0
PFOS	SW113	0.01[3]	0.10 (SW113)	5	1
Sum of PFHxS and PFOS	-	2[2]	0.13 (SW113)	5	0

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

> There was no first time detection of PFOA or Sum of PFOS and PFHxS, or new exceedance of guideline value at the surface water monitoring locations during the June 2021 monitoring event.

> Four out of five surface water samples reported PFAS concentrations below the laboratory LOR.

4.5 Sediment

4.5.1 Summary of Field Observations

Observations recorded during the sediment sampling program are provided in the field sampling record sheets within Appendix D.

4.5.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. Soil criteria are adopted in the absence of criteria for sediment for consistency with the SAQP (Cardno, June 2021), DSI (GHD, 2018) and ERA (GHD, 2019). A summary of results exceeding the adopted criteria is presented in Table 4-4. Laboratory results have also been compared to available historical data in order to identify monitoring locations where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 5 in Appendix A presents the sediment monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-4 Summary of Sediment Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (mg/kg)	Max Conc. (mg/kg)	No. Analytical Results[1]	No. Results Above Criteria
PFOA	-	10[2]	<0.0002	6	0
PFOS	-	0.01[3]	0.0013 (SD113)	6	0
Sum of PFHxS and PFOS	-	20[4]	0.0013 (SD113)	6	0

Notes:

1. Non-inclusive of quality control samples
2. Ecosystems – all land uses – Direct exposure (HEPA, 2020)
3. Ecosystems – all land uses – Indirect exposure (HEPA, 2020)
4. Human health – Commercial/Industrial (HEPA, 2020)

Findings are summarised as follows:

> There was no first-time detection of PFOA or Sum of PFOS and PFHxS at the sediment monitoring locations during the June 2021 monitoring event.

> No new exceedance of a guideline value was reported for any of the sediment monitoring locations during the June 2021 monitoring event.

> Five out of six sediment samples reported PFAS concentrations below the laboratory LOR.

4.6 Changes to the Monitoring Network Condition

No changes to the monitoring network condition were observed during the June 2021 monitoring event.

5 Summary and Conclusions

Cardno undertook the June 2021 groundwater, seepage water, surface water and sediment monitoring event at HEH-A as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 31 monitoring bores, five surface water locations, 12 seepage water sampling locations and six sediment monitoring locations. One groundwater monitoring bore (MW123) and one surface water monitoring location (SW126) could not be sampled.

Groundwater levels were gauged in all wells before sampling. Groundwater flow direction was interpreted to be radial from the site, with mounding occurring beneath the sand dunes, which is consistent with the previous monitoring events.

The groundwater laboratory results reported the following:

- Of the 31 samples that were tested, PFOS (12 samples) and Sum of PFHxS and PFOS (1 sample) reported concentrations that exceeded the HEPA (2020) ecological guideline value for 99% protection species and HEPA (2020) guideline value for recreational use respectively.
- There was no first time detect of Sum of PFOS and PFHxS or PFOA or new exceedances of guideline values for the groundwater monitoring locations during June 2021.

The seepage water laboratory results reported the following:

- 11 out of the 12 seepage water samples analysed reported PFAS concentrations below the laboratory LOR.
- There was no first-time detection of PFOA or Sum of PFOS and PFHxS, or new exceedance of guideline value at the seepage water monitoring locations during the June 2021 monitoring event.

The surface water laboratory results reported the following:

- Four out of five surface water samples reported PFAS concentrations below the laboratory LOR.
- There was no first time detection of PFOA or Sum of PFOS and PFHxS, or new exceedance of guideline value at the surface water monitoring locations during the June 2021 monitoring event.

The sediment laboratory results reported the following:

- Five out of six sediment samples reported PFAS concentrations below the laboratory LOR.
- There was no first time detection of PFOA or Sum of PFOS and PFHxS at the sediment monitoring locations.

The next OMP sampling event for HEH-A will be the November 2021 monitoring event.

6 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. *Contaminated Sites Act 2003*, Western Australia.
5. Department of Defence, May 2021, PFAS OMP Factual Report Guidance Version 0.2.
6. Department of Defence, July 2018 amended August 2019, *Contamination Management Manual*, Annex L *Guidance on Data Management*.
7. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
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APPENDIX A

FIGURES

FIGURE 1

1:100,000 Scale at A3

Meters

0 1,500 3,000

Site Location

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-08-10 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-001_RegionalLocation 03.mxd
Aerial Imagery Supplied by Google Earth

FIGURE 2

1:25,000 Scale at A3

Meters

0 500 1,000

Monitoring Area

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

N

Cardno

Map Produced by Cardno WA
Date: 2021-08-09 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-002_ManagementAreas 02.mxd

FIGURE 3

1:25,000 Scale at A3

Meters

0 500 1,000

Inferred Groundwater Contours

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-07-12 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-003_Jun-21_GWContours 01.mxd

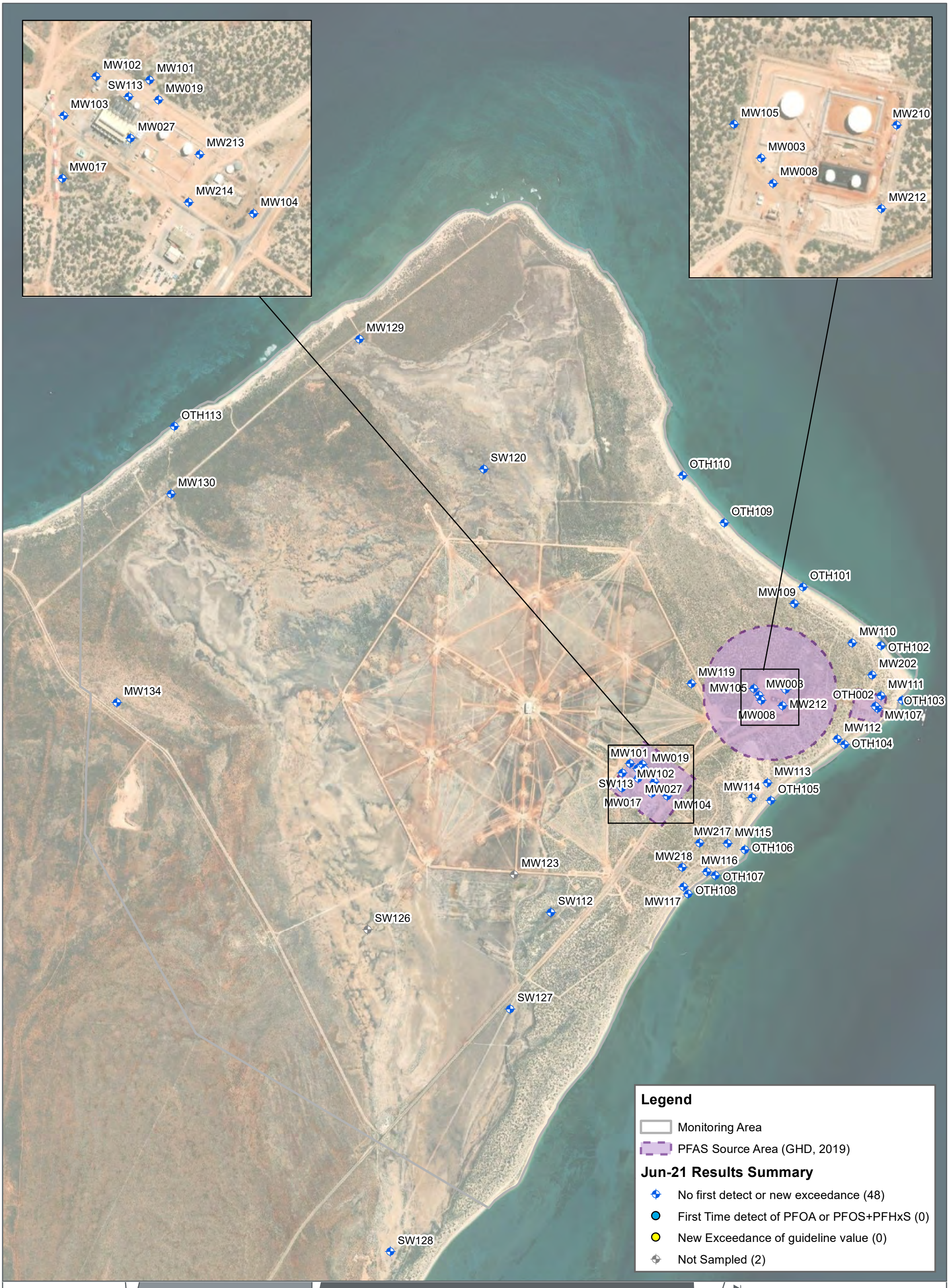

FIGURE 4

1:25,000 Scale at A3

Meters

0 500 1,000

Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-08-10 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-004_Jun21_W_Results 02.mxd

FIGURE 5

1:25,000 Scale at A3

Meters

0 500 1,000

Sediment Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA A
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-08-10 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0083-GS-005_Jun21_S_Results 01.mxd

APPENDIX

B

DATA ASSESSMENT TABLES

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids								
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05
PFAS NEMP 2020 Interim Marine 99%					*0.00023**						*19*				
PFAS NEMP 2020 Recreational Water											10				

Field ID	Date	Location Code	Well	Lab Report Number														
0083_MW003_210622	22/06/2021	MW003	-	EP2107184	<0.02	<0.02	0.04	<0.02	<0.01	<0.02	<0.1	0.06	0.05	0.05	0.01	<0.02	<0.02	<0.02	<0.05
0083_MW008_210622	22/06/2021	MW008	-	EP2107184	<0.02	<0.02	<0.02	<0.02	*0.08*	<0.02	<0.1	0.06	0.06	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW017_210622	22/06/2021	MW017	-	EP2107095	0.04	0.05	0.98	0.17	*9.72*	<0.02	0.6	2.08	2.20	0.84	0.54	<0.02	<0.02	0.04	<0.05
0083_MW019_210623	23/06/2021	MW019	-	EP2107188	<0.02	<0.02	0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW027_210623	23/06/2021	MW027	-	EP2107188	<0.02	<0.02	0.17	<0.02	*0.10*	<0.02	<0.1	0.03	<0.02	0.04	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW101_210623	23/06/2021	MW101	-	EP2107188	0.02	<0.02	0.31	<0.02	<0.01	<0.02	<0.1	0.29	<0.02	0.23	0.05	<0.02	<0.02	<0.02	<0.05
0083_MW102_210622	22/06/2021	MW102	-	EP2107184	<0.02	<0.02	0.31	<0.02	*0.05*	<0.02	<0.1	0.60	0.80	0.43	0.10	<0.02	<0.02	<0.02	<0.05
0083_MW103_210622	22/06/2021	MW103	-	EP2107184	0.09	0.08	0.50	<0.02	*0.09*	<0.02	0.4	1.21	1.48	0.27	0.04	<0.02	<0.02	<0.02	<0.05
0083_MW104_210622	22/06/2021	MW104	5.5-6.0	EP2107184	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW105_210622	22/06/2021	MW105	4.0-4.5	EP2107184	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW107_210622	22/06/2021	MW107	3.1-4.1	EP2107185	<0.02	<0.02	<0.02	<0.02	*0.05*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW109_210622	22/06/2021	MW109	9.3-9.8	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW110_210622	22/06/2021	MW110	9.0-9.5	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW111_210622	22/06/2021	MW111	10.5-11.0	EP2107185	<0.02	<0.02	<0.02	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW112_210622	22/06/2021	MW112	4.5-5.0	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW113_2.5-3.5_210622	22/06/2021	MW113	2.5-3.5	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW114_2.0-3.0_210622	22/06/2021	MW114	2.0-3.0	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW115_8.5-9.0_210622	22/06/2021	MW115	8.5-9.0	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW116_4.5-5.0_210622	22/06/2021	MW116	4.5-5.0	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW117_6.0-6.5_210622	22/06/2021	MW117	6.0-6.5	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW119_210623	23/06/2021	MW119	-	EP2107188	0.94	1.26	7.73	0.07	*0.11*	<0.02	0.4	2.99	1.04	0.26	0.16	<0.02	<0.02	<0.02	<0.05
0083_MW129_210622	22/06/2021	MW129	1.5-2.0	EP2107184	<0.02	<0.02	0.03	<0.02	*0.72*	<0.02	<0.1	0.03	0.03	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW130_210622	22/06/2021	MW130	1.4-1.9	EP2107184	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW134_210622	22/06/2021	MW134	-	EP2107184	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW202_210622	22/06/2021	MW202	-	EP2107185	<0.02	<0.02	<0.02	<0.02	*0.04*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW210_210622	22/06/2021	MW210	-	EP2107184	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW212_210622	22/06/2021	MW212	-	EP2107184	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW213_210623	23/06/2021	MW213	-	EP2107188	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW214_210622	22/06/2021	MW214	-	EP2107095	<0.02	<0.02	0.04	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW217_210622	22/06/2021	MW217	-	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_MW218_210622	22/06/2021	MW218	-	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH103_210622	22/06/2021	OTH103	NA	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH002_210622	22/06/2021	OTH002	NA	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH101_210622	22/06/2021	OTH101	NA	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH102_210622	22/06/2021	OTH102	NA	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH104_210622	22/06/2021	OTH104	NA	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH105_210622	22/06/2021	OTH105	NA	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH106_210622	22/06/2021	OTH106	NA	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH107_210622	22/06/2021	OTH107	NA	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH108_210622	22/06/2021	OTH108	NA	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH109_210622	22/06/2021	OTH109	NA	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH110_210622	22/06/2021	OTH110	NA	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_OTH113_210622	22/06/2021	OTH113	NA	EP2107184	<0.02	<0.02	0.02	<0.02	*0.54*	<0.02	<0.1	<0.02	0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_SW112_210622	22/06/2021	SW112	NA	EP2107186	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_SW113_210623	23/06/2021	SW113	NA	EP2107191	<0.02	<0.02	0.03	<0.02	*0.10*	<0.02	<0.1	0.25	0.36	0.16	0.07	<0.02	<0.02	0.02	<0.05
0083_SW120_210622	22/06/2021	SW120	NA	EP2107186	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_SW127_210622	22/06/2021	SW127	NA	EP2107094	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05
0083_SW128_210622	22/06/2021	SW128	NA	EP2107094	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L adopted based on typical current laboratory limit of reporting (HEPA, 2020)

			PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides							PFAS	
	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.02	0.02	0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01
PFAS NEMP 2020 Interim Marine 99%															
PFAS NEMP 2020 Recreational Water															2

Field ID	Date	Location Code	Well	Lab Report Number														
0083_MW003_210622	22/06/2021	MW003	-	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.21	0.04
0083_MW008_210622	22/06/2021	MW008	-	EP2107184	<0.02	<0.02	<0.05	0.08	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.28	0.08
0083_MW017_210622	22/06/2021	MW017	-	EP2107095	<0.02	<0.02	<0.05	5.06	0.81	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	22.9	10.7
0083_MW019_210623	23/06/2021	MW019	-	EP2107188	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02
0083_MW027_210623	23/06/2021	MW027	-	EP2107188	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.34	0.27
0083_MW101_210623	23/06/2021	MW101	-	EP2107188	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.90	0.31
0083_MW102_210622	22/06/2021	MW102	-	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	2.29	0.36
0083_MW103_210622	22/06/2021	MW103	-	EP2107184	<0.02	<0.02	<0.05	0.11	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	4.19	0.59
0083_MW104_210622	22/06/2021	MW104	5.5-6.0	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW105_210622	22/06/2021	MW105	4.0-4.5	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW107_210622	22/06/2021	MW107	3.1-4.1	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.05	0.05
0083_MW109_210622	22/06/2021	MW109	9.3-9.8	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW110_210622	22/06/2021	MW110	9.0-9.5	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW111_210622	22/06/2021	MW111	10.5-11.0	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02
0083_MW112_210622	22/06/2021	MW112	4.5-5.0	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW113_2.5-3.5_210622	22/06/2021	MW113	2.5-3.5	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW114_2.0-3.0_210622	22/06/2021	MW114	2.0-3.0	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW115_8.5-9.0_210622	22/06/2021	MW115	8.5-9.0	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW116_4.5-5.0_210622	22/06/2021	MW116	4.5-5.0	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW117_6.0-6.5_210622	22/06/2021	MW117	6.0-6.5	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW119_210623	23/06/2021	MW119	-	EP2107188	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	13.6	7.84
0083_MW129_210622	22/06/2021	MW129	1.5-2.0	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.81	0.75
0083_MW130_210622	22/06/2021	MW130	1.4-1.9	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW134_210622	22/06/2021	MW134	-	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW202_210622	22/06/2021	MW202	-	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.04	0.04
0083_MW210_210622	22/06/2021	MW210	-	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW212_210622	22/06/2021	MW212	-	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.03	0.03
0083_MW213_210623	23/06/2021	MW213	-	EP2107188	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW214_210622	22/06/2021	MW214	-	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.06	0.06
0083_MW217_210622	22/06/2021	MW217	-	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_MW218_210622	22/06/2021	MW218	-	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH103_210622	22/06/2021	OTH103	NA	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH002_210622	22/06/2021	OTH002	NA	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH101_210622	22/06/2021	OTH101	NA	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH102_210622	22/06/2021	OTH102	NA	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH104_210622	22/06/2021	OTH104	NA	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH105_210622	22/06/2021	OTH105	NA	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH106_210622	22/06/2021	OTH106	NA	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH107_210622	22/06/2021	OTH107	NA	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH108_210622	22/06/2021	OTH108	NA	EP2107095	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH109_210622	22/06/2021	OTH109	NA	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH110_210622	22/06/2021	OTH110	NA	EP2107185	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_OTH113_210622	22/06/2021	OTH113	NA	EP2107184	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.58	0.56
0083_SW112_210622	22/06/2021	SW112	NA	EP2107186	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_SW113_210623	23/06/2021	SW113	NA	EP2107191	<0.02	<0.02	<0.05	0.84	0.15	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.96	0.13
0083_SW120_210622	22/06/2021	SW120	NA	EP2107186	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_SW127_210622	22/06/2021	SW127	NA	EP2107094	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
0083_SW128_210622	22/06/2021	SW128	NA	EP2107094	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L adopted based on typical current laboratory limit of reporting (HEPA, 2020)

		Inorganics													
	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	TOC	Total Suspended Solids
	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	1	1	10	1	5
PFAS NEMP 2020 Interim Marine 99%															
PFAS NEMP 2020 Recreational Water															

Field ID	Date	Location Code	Well	Lab Report Number													
0083_MW003_210622	22/06/2021	MW003	-	EP2107184	0.21	<1	245	<1	245	319	319	10,200	0.01	7.71	5,370	1,260	20,000		285
0083_MW008_210622	22/06/2021	MW008	-	EP2107184	0.28	<1	218	<1	218	329	330	10,500	0.14	7.73	5,590	1,380	21,300		451
0083_MW017_210622	22/06/2021	MW017	-	EP2107095	23.1	<1	281	<1	281	298	304	9,340	0.88	7.69	5,100	1,410	21,200		<5
0083_MW019_210623	23/06/2021	MW019	-	EP2107188	0.02	<1	317	<1	317	296	323	9,300	4.51	7.62	5,570	1,290	21,700		38
0083_MW027_210623	23/06/2021	MW027	-	EP2107188	0.34	<1	356	<1	356	280	328	8,770	7.78	7.51	5,580	1,240	19,100		189
0083_MW101_210623	23/06/2021	MW101	-	EP2107188	0.90	<1	772	<1	772	229	234	7,300	0.98	7.82	4,020	389	14,700		355
0083_MW102_210622	22/06/2021	MW102	-	EP2107184	2.29	<1	231	<1	231	126	120	3,950	2.68	7.80	2,010	496	8,200		150
0083_MW103_210622	22/06/2021	MW103	-	EP2107184	4.27	<1	284	<1	284	218	181	6,790	9.48	7.71	3,020	1,020	11,600		378
0083_MW104_210622	22/06/2021	MW104	5.5-6.0	EP2107184	<0.01	<1	257	<1	257	160	162	4,810	0.51	7.80	2,660	934	10,400		3,630
0083_MW105_210622	22/06/2021	MW105	4.0-4.5	EP2107184	<0.01	<1	244	<1	244	332	326	10,700	1.02	7.69	5,480	1,230	21,300		393
0083_MW107_210622	22/06/2021	MW107	3.1-4.1	EP2107185	0.05	<1	153	<1	153	601	675	19,200	5.80	7.67	11,700	2,720	41,800		11,400
0083_MW109_210622	22/06/2021	MW109	9.3-9.8	EP2107185	<0.01	<1	104	<1	104	591	635	18,900	3.62	7.74	11,000	2,660	42,000		19
0083_MW110_210622	22/06/2021	MW110	9.0-9.5	EP2107185	<0.01	<1	154	<1	154	582	625	18,600	3.56	7.66	10,800	2,620	35,100		102
0083_MW111_210622	22/06/2021	MW111	10.5-11.0	EP2107185	0.02	<1	666	<1	666	569	638	18,000	5.74	7.96	11,000	2,290	36,300		134
0083_MW112_210622	22/06/2021	MW112	4.5-5.0	EP2107185	<0.01	<1	130	<1	130	589	664	18,800	6.04	7.76	11,500	2,680	42,300		28
0083_MW113_2.5-3.5_210622	22/06/2021	MW113	2.5-3.5	EP2107095	<0.01	<1	133	<1	133	556	671	17,900	9.36	7.73	11,600	2,330	38,700		2,620
0083_MW114_2.0-3.0_210622	22/06/2021	MW114	2.0-3.0	EP2107095	<0.01	<1	157	<1	157	598	526	19,300	6.44	7.66	9,040	2,420	42,900		3,880
0083_MW115_8.5-9.0_210622	22/06/2021	MW115	8.5-9.0	EP2107095	<0.01	<1	168	<1	168	544	638	17,500	7.98	7.76	11,000	2,250	38,400		182
0083_MW116_4.5-5.0_210622	22/06/2021	MW116	4.5-5.0	EP2107095	<0.01	<1	110	<1	110	581	646	18,800	5.35	7.72	11,200	2,310	42,700		12
0083_MW117_6.0-6.5_210622	22/06/2021	MW117	6.0-6.5	EP2107095	<0.01	<1	136	<1	136	610	692	19,700	6.36	7.72	12,000	2,460	41,500		258
0083_MW119_210623	23/06/2021	MW119	-	EP2107188	15.0	<1	272	<1	272	249	268	8,010	3.65	7.80	4,620	857	16,700		89
0083_MW129_210622	22/06/2021	MW129	1.5-2.0	EP2107184	0.81	<1	308	<1	308	561	626	18,200	5.43	7.53	10,800	2,000	37,400	30	61,700
0083_MW130_210622	22/06/2021	MW130	1.4-1.9	EP2107184	<0.01	<1	326	<1	326	579	614	18,700	2.96	7.54	10,500	2,150	38,500		4,180
0083_MW134_210622	22/06/2021	MW134	-	EP2107184	<0.01	<1	184	<1	184	430	510	13,900	8.49	7.58	8,900	1,670	30,600		269
0083_MW202_210622	22/06/2021	MW202	-	EP2107185	0.04	<1	174	<1	174	568	654	18,200	6.98	7.64	11,300	2,470	38,900		117
0083_MW210_210622	22/06/2021	MW210	-	EP2107184	<0.01	<1	265	<1	265	284	292	9,100	1.30	7.71	4,910	1,070	18,800		93
0083_MW212_210622	22/06/2021	MW212	-	EP2107184	0.03	<1	216	<1	216	374	343	12,200	4.30	7.73	5,850	1,230	22,400		51
0083_MW213_210623	23/06/2021	MW213	-	EP2107188	0.03	<1	471	<1	471	49.7	44.2	1,360	5.78	7.79	614	91	2,740		22
0083_MW214_210622	22/06/2021	MW214	-	EP2107095	0.06									8.06			3,410		18
0083_MW217_210622	22/06/2021	MW217	-	EP2107095	<0.01	<1	147	<1	147	478	537	15,500	5.78	7.65	9,310	1,840	33,800		226
0083_MW218_210622	22/06/2021	MW218	-	EP2107095	<0.01	<1	188	<1	188	239	251	7,640	2.32	7.76	4,250	962	18,800		66
0083_OTH103_210622	22/06/2021	OTH103	NA	EP2107185	<0.01	<1	123	<1	123	592	658	18,900	5.34	7.81	11,400	2,700	42,000		184
0083_OTH002_210622	22/06/2021	OTH002	NA	EP2107185	<0.01	<1	114	<1	114	594	674	19,000	6.30	7.86	11,700	2,700	39,400		42
0083_OTH101_210622	22/06/2021	OTH101	NA	EP2107185	<0.01	<1	117	<1	117	591	688	18,900	7.57	8.04	11,900	2,670	41,800		47
0083_OTH102_210622	22/06/2021	OTH102	NA	EP2107185	<0.01	<1	115	<1	115	588	697	18,800	8.47	8.03	12,100	2,680	41,000		60
0083_OTH104_210622	22/06/2021	OTH104	NA	EP2107185	<0.01	<1	119	<1	119	600	664	19,200	5.02	7.99	11,500	2,710	42,100		124
0083_OTH105_210622	22/06/2021	OTH105	NA	EP2107095	<0.01	<1	117	<1	117	599	677	19,300	6.14	7.98	11,900	2,490	40,000		44
0083_OTH106_210622	22/06/2021	OTH106	NA	EP2107095	<0.01	<1	118	<1	118	583	664	18,800	6.46	8.00	11,500	2,420	42,400		82
0083_OTH107_210622	22/06/2021	OTH107	NA	EP2107095	<0.01	<1	129	<1	129	601	687	19,400	6.68	7.73	11,900	2,450	40,600		174
0083_OTH108_210622	22/06/2021	OTH108	NA	EP2107095	<0.01	<1	119	<1	119	616	692	19,900	5.82	7.87	12,000	2,510	39,300		8
0083_OTH109_210622	22/06/2021	OTH109	NA	EP2107185	<0.01	<1	117	<1	117	591	635	18,900	3.60	7.94	11,000	2,670	42,300		18
0083_OTH110_210622	22/06/2021	OTH110	NA	EP2107185	<0.01	<1	120	<1	120	597	646	19,100	3.97	7.91	11,200	2,680	41,800		31
0083_OTH113_210622	22/06/2021	OTH113	NA	EP2107184	0.58	<1	113	<1	113	610	681	19,800	5.52	8.06	11,800	2,350	41,100		32
0083_SW112_210622	22/06/2021	SW112	NA	EP2107186	<0.01	<1	181	<1	181	832	962	26,200	7.23	8.00	16,400	4,310	58,800		42
0083_SW113_210623	23/06/2021	SW113	NA	EP2107191	1.98	<1	80	<1	80	4.80	4.99	72	1.98	7.84	53	56	379		<5
0083_SW120_210622	22/06/2021	SW120	NA	EP2107186	<0.01	<1	69	<1	69	297	294	8,670	0.46	7.74	4,470	2,450	19,700		133
0083_SW127_210622	22/06/2021	SW127	NA	EP2107094	<0.01	<1	108	<1	108	245	228	6,800	3.64	7.82	3,250	2,460	16,800		15
0083_SW128_210622	22/06/2021	SW128	NA	EP2107094	<0.01	<1	59	<1	59	142	148	3,860	1.95	7.69	2,080	1,550	10,000		12

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L adopted based on typical current laboratory limit of reporting (HEPA, 2020)

	Metals			Organic
	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting	1	1	1	1
PFAS NEMP 2020 Interim Marine 99%				
PFAS NEMP 2020 Recreational Water				

Field ID	Date	Location Code	Well	Lab Report Number				
0083_MW003_210622	22/06/2021	MW003	-	EP2107184	304	759	295	5
0083_MW008_210622	22/06/2021	MW008	-	EP2107184	294	784	306	3
0083_MW017_210622	22/06/2021	MW017	-	EP2107095	316	707	312	9
0083_MW019_210623	23/06/2021	MW019	-	EP2107188	286	718	306	43
0083_MW027_210623	23/06/2021	MW027	-	EP2107188	341	730	304	28
0083_MW101_210623	23/06/2021	MW101	-	EP2107188	182	542	213	
0083_MW102_210622	22/06/2021	MW102	-	EP2107184	143	268	123	29
0083_MW103_210622	22/06/2021	MW103	-	EP2107184	226	404	185	9
0083_MW104_210622	22/06/2021	MW104	5.5-6.0	EP2107184	189	393	173	6
0083_MW105_210622	22/06/2021	MW105	4.0-4.5	EP2107184	288	789	309	8
0083_MW107_210622	22/06/2021	MW107	3.1-4.1	EP2107185	492	1,520	658	5
0083_MW109_210622	22/06/2021	MW109	9.3-9.8	EP2107185	448	1,440	614	<1
0083_MW110_210622	22/06/2021	MW110	9.0-9.5	EP2107185	466	1,420	605	23
0083_MW111_210622	22/06/2021	MW111	10.5-11.0	EP2107185	496	1,440	636	9
0083_MW112_210622	22/06/2021	MW112	4.5-5.0	EP2107185	481	1,500	653	1
0083_MW113_2.5-3.5_210622	22/06/2021	MW113	2.5-3.5	EP2107095	491	1,520	655	2
0083_MW114_2.0-3.0_210622	22/06/2021	MW114	2.0-3.0	EP2107095	390	1,220	490	7
0083_MW115_8.5-9.0_210622	22/06/2021	MW115	8.5-9.0	EP2107095	472	1,460	623	6
0083_MW116_4.5-5.0_210622	22/06/2021	MW116	4.5-5.0	EP2107095	458	1,460	630	2
0083_MW117_6.0-6.5_210622	22/06/2021	MW117	6.0-6.5	EP2107095	493	1,560	686	3
0083_MW119_210623	23/06/2021	MW119	-	EP2107188	214	604	265	8
0083_MW129_210622	22/06/2021	MW129	1.5-2.0	EP2107184	539	1,390	572	
0083_MW130_210622	22/06/2021	MW130	1.4-1.9	EP2107184	482	1,440	579	9
0083_MW134_210622	22/06/2021	MW134	-	EP2107184	465	1,060	505	4
0083_MW202_210622	22/06/2021	MW202	-	EP2107185	461	1,490	641	3
0083_MW210_210622	22/06/2021	MW210	-	EP2107184	289	689	276	4
0083_MW212_210622	22/06/2021	MW212	-	EP2107184	297	797	326	3
0083_MW213_210623	23/06/2021	MW213	-	EP2107188	130	119	49	
0083_MW214_210622	22/06/2021	MW214	-	EP2107095				
0083_MW217_210622	22/06/2021	MW217	-	EP2107095	415	1,190	532	3
0083_MW218_210622	22/06/2021	MW218	-	EP2107095	245	575	244	3
0083_OTH103_210622	22/06/2021	OTH103	NA	EP2107185	474	1,490	641	4
0083_OTH002_210622	22/06/2021	OTH002	NA	EP2107185	475	1,520	655	3
0083_OTH101_210622	22/06/2021	OTH101	NA	EP2107185	494	1,560	674	<1
0083_OTH102_210622	22/06/2021	OTH102	NA	EP2107185	492	1,570	676	2
0083_OTH104_210622	22/06/2021	OTH104	NA	EP2107185	474	1,500	647	<1
0083_OTH105_210622	22/06/2021	OTH105	NA	EP2107095	462	1,490	531	4
0083_OTH106_210622	22/06/2021	OTH106	NA	EP2107095	468	1,500	647	3
0083_OTH107_210622	22/06/2021	OTH107	NA	EP2107095	492	1,550	670	5
0083_OTH108_210622	22/06/2021	OTH108	NA	EP2107095	491	1,560	676	3
0083_OTH109_210622	22/06/2021	OTH109	NA	EP2107185	452	1,440	613	4
0083_OTH110_210622	22/06/2021	OTH110	NA	EP2107185	462	1,460	622	<1
0083_OTH113_210622	22/06/2021	OTH113	NA	EP2107184	480	1,540	665	2
0083_SW112_210622	22/06/2021	SW112	NA	EP2107186	1,150	2,060	858	14
0083_SW113_210623	23/06/2021	SW113	NA	EP2107191	44	5	3	55
0083_SW120_210622	22/06/2021	SW120	NA	EP2107186	965	551	247	16
0083_SW127_210622	22/06/2021	SW127	NA	EP2107094	882	459	188	13
0083_SW128_210622	22/06/2021	SW128	NA	EP2107094	589	305	118	6

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L adopted based on typical current laboratory limit of reporting (HEPA, 2020)

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR - Limit of Reporting	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0005
PFAS NEMP 2020 Ecological direct exposure					*1*						*10*							
PFAS NEMP 2020 Ecological indirect exposure					0.01													
PFAS NEMP 2020 Industrial/ commercial (HIL D)											50							
Field ID	Date	Location Code	Lab Report Number															
0083_SD112_210622	22/06/2021	SD112	EP2107187	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005
0083_SD113_210623	23/06/2021	SD113	EP2107192	<0.0002	<0.0002	<0.0002	<0.0002	0.0013	<0.0002	<0.001	0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005
0083_SD120_210622	22/06/2021	SD120	EP2107187	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005
0083_SD126_210622	22/06/2021	SD126	EP2107187	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005
0083_SD127_210622	22/06/2021	SD127	EP2107093	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005
0083_SD128_210622	22/06/2021	SD128	EP2107093	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

	- Fluorotelomer Sulfonic Acids			PFAS - Perfluoroalkyl Sulfonamides							PFAS			Organic
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Organic Matter
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%
LOR - Limit of Reporting	0.0005	0.0005	0.0005	0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.5
PFAS NEMP 2020 Ecological direct exposure														
PFAS NEMP 2020 Ecological indirect exposure														
PFAS NEMP 2020 Industrial/ commercial (HIL D)												20		

Field ID	Date	Location Code	Lab Report Number												
0083_SD112_210622	22/06/2021	SD112	EP2107187	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	3.8
0083_SD113_210623	23/06/2021	SD113	EP2107192	0.0022	0.0044	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0086	0.0013	0.0086	10.8
0083_SD120_210622	22/06/2021	SD120	EP2107187	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	11.0
0083_SD126_210622	22/06/2021	SD126	EP2107187	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.4
0083_SD127_210622	22/06/2021	SD127	EP2107093	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	3.7
0083_SD128_210622	22/06/2021	SD128	EP2107093	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.6

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic A		
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05	0.05
PFAS NEMP 2020 Interim Marine 99%					*0.00023*						*19*									
PFAS NEMP 2020 Recreational Water											10									
Field ID	Date	Lab Report Number																		
0083_QC301_210622	22/06/2021	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
0083_QC301_210623	23/06/2021	EP2107188	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
0083_QC302_210622	22/06/2021	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
0083_QC303_210622	22/06/2021	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
0083_QC401_210622	22/06/2021	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
0083_QC401_210623	23/06/2021	EP2107188	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
0083_QC402_210622	22/06/2021	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05
0083_QC403_210622	22/06/2021	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05

	Acids	PFAS - Perfluoroalkyl Sulfonamides							PFAS		
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
PFAS NEMP 2020 Interim Marine 99%											
PFAS NEMP 2020 Recreational Water										2	

Field ID	Date	Lab Report Number										
0083_QC301_210622	22/06/2021	EP2107095	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC301_210623	23/06/2021	EP2107188	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC302_210622	22/06/2021	EP2107095	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC303_210622	22/06/2021	EP2107095	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC401_210622	22/06/2021	EP2107095	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC401_210623	23/06/2021	EP2107188	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC402_210622	22/06/2021	EP2107095	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0083_QC403_210622	22/06/2021	EP2107095	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Field ID			0083_OTH002_210622	0083_QC103_210622		0083_OTH002_210622	0083_QC203_210622		0083_SW128_210622	0083_QC102_210622		0083_SW128_210622	0083_QC202_210622	
Date			22/06/2021	22/06/2021		22/06/2021	22/06/2021		22/06/2021	22/06/2021		22/06/2021	22/06/2021	
Matrix Type			Water	Water		Water	Water		Water	Water		Water	Water	
Lab Report Number			EP2107185	EP2107185	RPD	EP2107185	805492	RPD	EP2107094	EP2107094	RPD	EP2107094	805492	RPD
	Unit	LOR												
PFAS - Perfluoroalkyl Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01					<0.01						<0.01	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01					<0.01						<0.01	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids														
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
PFAS - Perfluoroalkyl Sulfonamides														
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS														
Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.05	0	<0.01	<0.01	0	<0.01	<0.05	0
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.1	0	<0.01	<0.01	0	<0.01	<0.1	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					<0.01						<0.01	
Sum of PFAS (PFOS + PFOA)	µg/L	0.01					<0.01						<0.01	
Inorganics														
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	114	116	2	114	140	20	59	59	0	59	70	17
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1	114	116	2	114	140	20	59	59	0	59	70	17
Anions Total	meq/L	0.01	594	595	0	594			142	142	0	142		
Cations Total	meq/L	0.01	674	681	1	674			148	151	2	148		
Chloride	mg/L	1	19,000	19,000	0	19,000	20,000	5	3,860	3,870	0	3,860	3,700	4
Ionic Balance	%	0.01	6.30	6.76	7	6.30			1.95	3.26	50	1.95		
pH (Lab)	pH Units	0.01	7.86	7.90	1	7.86	8.2	4	7.69	7.70	0	7.69	7.9	3
Sodium	mg/L	0.5					10,000						2,200	
Sodium (filtered)	mg/L	0.5	11,700	11,800	1	11,700			2,080	2,130	2	2,080		
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	2,700	2,730	1	2,700			1,550	1,500	3	1,550		
Sulphate	mg/L	5					3,000						1,900	
TDS	mg/L	10	39,400	42,700	8	39,400	24,000	49	10,000	10,000	0	10,000	9,300	7
Total Suspended Solids	mg/L	1	42	29	37	42	11	117	12	12	0	12	6.2	64
Metals														
Calcium	mg/L	0.5					540						570	
Calcium (filtered)	mg/L	0.5	475	488	3	475			589	600	2	589		
Magnesium	mg/L	0.5					1,500						310	
Magnesium (filtered)	mg/L	0.5	1,520	1,540	1	1,520			305	310	2	305		
Potassium	mg/L	0.5					500						92	
Potassium (filtered)	mg/L	0.5	655	665	2	655			118	118	0	118		
Organic														
Dissolved Organic Carbon	mg/L	1	3	2	40	3			6	5	18	6		

*RPDs have only been considered where a concentration is greater than 1 times the LOR.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each LOR multiplier range are: No Limit (1 - 10 x LOR); 50 (10 - 20 x LOR); 20 (> 20 x LOR))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Field ID			0083_MW003_210622	0083_QC104_210622		0083_MW003_210622	0083_QC204_210622		0083_MW212_210622	0083_QC105_210622		0083_MW212_210622	0083_QC205_210622	
Date			22/06/2021	22/06/2021		22/06/2021	22/06/2021		22/06/2021	22/06/2021		22/06/2021	22/06/2021	
Matrix Type			Water	Water		Water	Water		Water	Water		Water	Water	
Lab Report Number			EP2107184	EP2107184	RPD	EP2107184	805492	RPD	EP2107184	EP2107184	RPD	EP2107184	805492	RPD
	Unit	LOR												
PFAS - Perfluoroalkyl Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01					<0.01							
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.04	0.03	29	0.04	0.03	29	0.03	0.03	0	0.03	0.02	40
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	0.61	194	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01					<0.01							
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
PFAS - Perfluoroalkyl Carboxylic Acids														
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.1	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.06	<0.02	100	0.06	0.02	100	<0.02	<0.02	0	<0.02	<0.02	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.05	<0.02	86	0.05	0.03	50	<0.02	<0.02	0	<0.02	<0.02	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.05	<0.02	86	0.05	<0.01	133	<0.02	<0.02	0	<0.02	<0.02	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.01	<0.01	0	0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.05	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.02	0
PFAS - Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.05	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	0.07	33	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.05	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS - Perfluoroalkyl Sulfonamides														
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.02	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.02	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.02	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS														
Sum of PFAS (WA DER List)	µg/L	0.01	0.21	0.03	150	0.21	0.76	113	0.03	0.03	0	0.03	0.02	40
Sum of PFHxS and PFOS	µg/L	0.01	0.04	0.03	29	0.04	0.64	176	0.03	0.03	0	0.03	0.02	40
Sum of PFAS	µg/L	0.01	0.21	0.03	150	0.21	0.76	113	0.03	0.03	0	0.03	0.02	40
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					0.64							
Sum of PFAS (PFOS + PFOA)	µg/L	0.01					0.61						<0.01	
Inorganics														
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	245	238	3	245	420	53	216	226	5	216	220	2
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1	245	238	3	245	420	53	216	226	5	216	220	2
Anions Total	meq/L	0.01	319	329	3	319			374	375	0	374		
Cations Total	meq/L	0.01	319	287	11	319			343	382	11	343		
Chloride	mg/L	1	10,200	10,500	3	10,200	8,200	22	12,200	12,100	1	12,200	10,000	20
Ionic Balance	%	0.01	0.01	6.73	199	0.01			4.30	0.82	136	4.30		
pH (Lab)	pH Units	0.01	7.71	7.77	1	7.71	8.3	7	7.73	7.74	0	7.73	8.2	6
Sodium	mg/L	0.5					4,600						6,600	
Sodium (filtered)	mg/L	0.5	5,370	4,820	11	5,370			5,850	6,510	11	5,850		
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	1,260	1,330	5	1,260			1,230	1,420	14	1,230		
Sulphate	mg/L	5					1,000						1,300	
TDS	mg/L	10	20,000	18,700	7	20,000	14,000	35	22,400	24,100	7	22,400	11,000	68
Total Suspended Solids	mg/L	1	285	273	4	285	17	177	51	29	55	51	3.8	172
Metals														
Calcium	mg/L	0.5					280						300	
Calcium (filtered)	mg/L	0.5	304	290	5	304			297	319	7	297		
Magnesium	mg/L	0.5					540						770	
Magnesium (filtered)	mg/L	0.5	759	683	11	759			797	891	11	797		
Potassium	mg/L	0.5					170						250	
Potassium (filtered)	mg/L	0.5	295	267	10	295			326	361	10	326		
Organic														
Dissolved Organic Carbon	mg/L	1	5	5	0	5			3	3	0	3		

Field ID			0083_MW103_210622	0083_QC106_210622		0083_MW103_210622	0083_QC206_210622		0083_MW104_210622	0083_QC107_210622		0083_MW104_210622	0083_QC207_210622	
Date			22/06/2021	22/06/2021		22/06/2021	22/06/2021		22/06/2021	22/06/2021		22/06/2021	22/06/2021	
Matrix Type			Water	Water		Water	Water		Water	Water		Water	Water	
Lab Report Number			EP2107184	EP2107184	RPD	EP2107184	805492	RPD	EP2107184	EP2107184	RPD	EP2107184	805492	RPD
	Unit	LOR												
PFAS - Perfluoroalkyl Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		<0.01			0.02						<0.01	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.01	0	0.09	0.09	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.01	0	0.08	0.08	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.03	0.02	40	0.50	0.51	2	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	0.09	0.08	12	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		<0.01			<0.01						<0.01	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids														
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.05	0	0.4	0.50	22	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.01	0	1.21	1.1	10	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.01	0	1.48	1.3	13	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.01	0	0.27	0.23	16	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	0.04	0.03	29	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	0.11	0.10	10	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
PFAS - Perfluoroalkyl Sulfonamides														
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS														
Sum of PFAS (WA DER List)	µg/L	0.01	0.03	<0.05	0	4.19	3.94	6	<0.01	<0.01	0	<0.01	<0.05	0
Sum of PFHxS and PFOS	µg/L	0.01	0.03	0.02	40	0.59	0.59	0	<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS	µg/L	0.01	0.03	<0.1	0	4.27	4.04	6	<0.01	<0.01	0	<0.01	<0.1	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01		0.02			0.62						<0.01	
Sum of PFAS (PFOS + PFOA)	µg/L	0.01					0.11						<0.01	
Inorganics														
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	284	288	1	284	600	71	257	283	10	257	870	109
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1	284	288	1	284	600	71	257	283	10	257	870	109
Anions Total	meq/L	0.01	218	284	26	218			160	200	22	160		
Cations Total	meq/L	0.01	181	251	32	181			162	187	14	162		
Chloride	mg/L	1	6,790	8,960	28	6,790	8,600	24	4,810	6,220	26	4,810	5,000	4
Ionic Balance	%	0.01	9.48	6.29	40	9.48			0.51	3.45	148	0.51		
pH (Lab)	pH Units	0.01	7.71	7.66	1	7.71	8.3	7	7.80	7.80	0	7.80	8.3	6
Sodium	mg/L	0.5					4,900						3,300	
Sodium (filtered)	mg/L	0.5	3,020	4,310	35	3,020			2,660	3,100	15	2,660		
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	1,020	1,250	20	1,020			934	905	3	934		
Sulphate	mg/L	5					1,400						990	
TDS	mg/L	10	11,600	15,900	31	11,600	16,000	32	10,400	12,300	17	10,400	9,200	12
Total Suspended Solids	mg/L	1	378	546	36	378	7.4	192	3,630	2,600	33	3,630	13	199
Metals														
Calcium	mg/L	0.5					280						230	
Calcium (filtered)	mg/L	0.5	226	261	14	226			189	235	22	189		
Magnesium	mg/L	0.5					550						400	
Magnesium (filtered)	mg/L	0.5	404	544	30	404			393	428	9	393		
Potassium	mg/L	0.5					200						140	
Potassium (filtered)	mg/L	0.5	185	218	16	185			173	188	8	173		
Organic														
Dissolved Organic Carbon	mg/L	1	9	8	12	9			6	5	18	6		

	Field ID	0083_SD128_210622	0083_QC101_210622		0083_SD128_210622	0083_QC201_210622	
	Date	22/06/2021	22/06/2021		22/06/2021	22/06/2021	
	Matrix Type	Soil	Soil		Soil	Soil	
	Lab Report Number	EP2107093	EP2107093	RPD	EP2107093	805492	RPD
	Unit	LOR						
PFAS - Perfluoroalkyl Sulfonic Acids								
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005					<0.005	
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005					<0.005	
Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS - Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS - Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS - Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS								
Sum of PFAS (WA DER List)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0
Sum of PFHxS and PFOS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0
Sum of PFAS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.05	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	0.005					<0.005	
Sum of PFAS (PFOS + PFOA)	mg/kg	0.005					<0.005	
Inorganics								
Conductivity (1:5 aqueous extract)	µS/cm	10					1,300	
Exchangeable Sodium Percent	%	0.1	0.8	0.7	13	0.8		
pH (1:5 Aqueous extract at 25Â°C as rec.)	pH Units	0.1					8.7	
Moisture Content	%	0.1	18.2	17.0	7	18.2	19	4
Exchangeable Calcium	meq/100g	0.1	23.0	21.6	6	23.0		
Exchangeable Magnesium	meq/100g	0.1	2.8	2.5	11	2.8		
Exchangeable Potassium	meq/100g	0.1	<0.1	<0.1	0	<0.1		
Exchangeable Sodium	meq/100g	0.1	0.2	0.2	0	0.2		
CEC	meq/100g	0.05	26.0	24.3	7	26.0	31	18
Electrical conductivity *(lab)	µS/cm	1	1,800	2,260	23	1,800		
pH (Lab)	pH Units	0.1	8.6	8.6	0	8.6		
TOC	mg/kg	1,000					<1,000	
Organic								
Organic Matter	%	0.5	2.6	2.5	4	2.6		

*RPDs have only been considered where a concentration is greater than 1 times the LOR.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each LOR multiplier range are: No Limit (1 - 10 x LOR); 50 (10 - 20 x LOR); 20 (> 20 x LOR))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

APPENDIX

C

LABORATORY CERTIFICATES

CHAIN OF CUSTODY

ALS COC#: 24441 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 1135 24/6/21	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD128		22/06/2021 09:12 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0083_QC101		22/06/2021 09:13 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0083_SD127		22/06/2021 09:55 AM	Soil	ALS: 2 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: 24441 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD128	Soil Glass Jar - Unpreserved	150 mL	00260321005628	Orange	No	
001	0083_SD128	HDPE Soil Jar	200 mL	00620719063159	Grey	No	
002	0083_QC101	Soil Glass Jar - Unpreserved	150 mL	00260321005681	Orange	No	
002	0083_QC101	HDPE Soil Jar	200 mL	00620719063203	Grey	No	
003	0083_SD127	HDPE Soil Jar	200 mL	00620719063122	Grey	No	
003	0083_SD127	Soil Glass Jar - Unpreserved	150 mL	00260321005783	Orange	No	

Total Bottle Count: ALS: 6, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107093**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24441	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: MB DEF19009/HEHA SED		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 24-Jun-2021 11:35	Issue Date	: 25-Jun-2021
Client Requested Due Date	: 06-Jul-2021	Scheduled Reporting Date	: **06-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 8.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2107093-001	22-Jun-2021 09:12	0083_SD128_210622	✓	✓	✓	✓
EP2107093-002	22-Jun-2021 09:13	0083_QC101_210622	✓	✓	✓	✓
EP2107093-003	22-Jun-2021 09:55	0083_SD127_210622	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

CLAIRE ARMSTRONG		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
Laura Beames		
- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107093**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021 11:35
Order number	: DEF19009/0083	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24441	Issue Date	: 05-Jul-2021 17:55
Sampler	: MAELLE BOURDAIS		
Site	: MB DEF19009/HEHA SED		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD128_210622	0083_QC101_210622	0083_SD127_210622	----	----
			Sampling date / time	22-Jun-2021 09:12	22-Jun-2021 09:13	22-Jun-2021 09:55	----	----
Compound	CAS Number	LOR	Unit	EP2107093-001	EP2107093-002	EP2107093-003	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.6	8.6	8.4	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	1800	2260	3350	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	18.2	17.0	31.4	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	23.0	21.6	59.5	----	----
Exchangeable Magnesium	----	0.1	meq/100g	2.8	2.5	2.1	----	----
Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	<0.1	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.3	----	----
Cation Exchange Capacity	----	0.1	meq/100g	26.0	24.3	61.9	----	----
Exchangeable Sodium Percent	----	0.1	%	0.8	0.7	0.4	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	2.6	2.5	3.7	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD128_210622	0083_QC101_210622	0083_SD127_210622	----	----
				Sampling date / time	22-Jun-2021 09:12	22-Jun-2021 09:13	22-Jun-2021 09:55	----	----
Compound	CAS Number	LOR	Unit		EP2107093-001	EP2107093-002	EP2107093-003	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD128_210622	0083_QC101_210622	0083_SD127_210622	----	----
			Sampling date / time	22-Jun-2021 09:12	22-Jun-2021 09:13	22-Jun-2021 09:55	----	----
Compound	CAS Number	LOR	Unit	EP2107093-001	EP2107093-002	EP2107093-003	--------	--------
				Result	Result	Result	----	----
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**85.5**	**88.5**	**75.0**	----	----
13C8-PFOA	----	0.0002	%	**79.0**	**84.0**	**80.5**	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107093**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24441	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: MB DEF19009/HEHA SED		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3764010)									
EP2107093-001	0083_SD128_210622	EA002: pH Value	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EP2107194-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3764009)									
EP2107093-001	0083_SD128_210622	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	1800	1800	0.4	0% - 20%
EP2107194-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	78	78	0.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3761416)									
EP2107026-001	Anonymous	EA055: Moisture Content	----	0.1	%	41.5	44.5	7.2	0% - 20%
EP2107034-003	Anonymous	EA055: Moisture Content	----	0.1	%	4.5	4.6	3.5	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3770345)									
EP2107026-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.9	2.2	16.1	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	14.0	13.7	2.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.4	4.7	6.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.3	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	19.0	19.1	0.0	0% - 20%
EP2107187-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.4	0.4	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	40.0	46.8	15.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.6	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	42.9	49.8	14.9	0% - 20%
EP004: Organic Matter (QC Lot: 3761397)									
EP2107026-001	Anonymous	EP004: Organic Matter	----	0.5	%	5.6	5.6	0.0	0% - 50%
EP2107034-004	Anonymous	EP004: Organic Matter	----	0.5	%	1.3	1.1	10.6	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3767628)									
EP2107093-001	0083_SD128_210622	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2107187-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3767628)									
EP2107093-001	0083_SD128_210622	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2107187-002	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3767628)									
EP2107093-001	0083_SD128_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3767628) - continued									
EP2107093-001	0083_SD128_210622	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107187-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3767628)									
EP2107093-001	0083_SD128_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107187-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3764010)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3764009)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	98.5	93.6	106
ED008: Exchangeable Cations (QCLot: 3770345)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	89.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	87.8	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	100	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	89.8	79.9	110
EP004: Organic Matter (QCLot: 3761397)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	118	70.0	120
				<0.5	85 %	91.7	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3767628)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.8	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.8	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3767628)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	83.7	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.2	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	86.5	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3767628)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3767628) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	97.0	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	81.1	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.3	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.4	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3767628)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	81.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	82.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	80.4	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	91.6	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3767628)							
EP2107093-001	0083_SD128_210622	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	74.8	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	82.4	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	77.2	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	76.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	75.6	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	120	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3767628)							
EP2107093-001	0083_SD128_210622	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	86.0	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	81.6	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	82.4	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	85.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	80.8	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	79.6	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	82.4	69.0	133

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3767628) - continued							
EP2107093-001	0083_SD128_210622	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	77.2	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	84.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	78.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	85.1	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3767628)							
EP2107093-001	0083_SD128_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	87.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	98.1	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	83.3	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	87.0	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	83.0	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	90.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	78.4	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3767628)							
EP2107093-001	0083_SD128_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	95.6	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	72.0	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	94.0	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	103	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107093**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Site	: MB DEF19009/HEHA SED	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 3
Order number	: DEF19009/0083	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved							
0083_SD128_210622, 0083_SD127_210622	0083_QC101_210622,	01-Jul-2021	29-Jun-2021	**2**	----	----	----
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved							
0083_SD128_210622, 0083_SD127_210622	0083_QC101_210622,	01-Jul-2021	29-Jun-2021	**2**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0083_SD128_210622, 0083_SD127_210622	0083_QC101_210622,	**22-Jun-2021**	**01-Jul-2021**	29-Jun-2021	×	**01-Jul-2021**	01-Jul-2021	✓
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0083_SD128_210622, 0083_SD127_210622	0083_QC101_210622,	**22-Jun-2021**	**01-Jul-2021**	29-Jun-2021	×	**01-Jul-2021**	29-Jul-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0083_SD128_210622, 0083_SD127_210622	0083_QC101_210622,	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	06-Jul-2021	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0083_SD128_210622, 0083_SD127_210622	0083_QC101_210622,	**22-Jun-2021**	**02-Jul-2021**	20-Jul-2021	✓	**02-Jul-2021**	20-Jul-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0083_SD128_210622, 0083_QC101_210622, 0083_SD127_210622	**22-Jun-2021**	**05-Jul-2021**	20-Jul-2021	✓	**05-Jul-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD128_210622, 0083_QC101_210622, 0083_SD127_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0083_SD128_210622, 0083_QC101_210622, 0083_SD127_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0083_SD128_210622, 0083_QC101_210622, 0083_SD127_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD128_210622, 0083_QC101_210622, 0083_SD127_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0083_SD128_210622, 0083_QC101_210622, 0083_SD127_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

CHAIN OF CUSTODY

ALS COC#: **24445** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: MD 11:35 24/6/21	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SW128		22/06/2021 09:35 AM	Water	ALS: 5 Non ALS: 0	No	X		
002	0083_QC102		22/06/2021 09:37 AM	Water	ALS: 5 Non ALS: 0	No	X		
003	0083_SW127		22/06/2021 09:54 AM	Water	ALS: 4 Non ALS: 1	No	X		DOC vial filtered

CHAIN OF CUSTODY

ALS COC#: **24445** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SW128	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002421	Purple	No	
001	0083_SW128	Clear Plastic Bottle - Natural	250 mL	00070220186420	Green	No	
001	0083_SW128	Clear Plastic Bottle - Natural	250 mL	00070220186698	Green	No	
001	0083_SW128	HDPE (no PTFE)	20 mL	00352005019313	Grey	No	
002	0083_QC102	HDPE (no PTFE)	20 mL	00352005019349	Grey	No	
002	0083_QC102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002629	Purple	No	
002	0083_QC102	Clear Plastic Bottle - Natural	250 mL	00070220186583	Green	No	
002	0083_QC102	Clear Plastic Bottle - Natural	250 mL	00070220186419	Green	No	
002	0083_QC102	HDPE (no PTFE)	20 mL	00352005019694	Grey	No	
003	0083_SW127	HDPE (no PTFE)	20 mL	00352005019758	Grey	No	
003	0083_SW127	Clear Plastic Bottle - Natural	250 mL	00070220142827	Green	No	
003	0083_SW127	Clear Plastic Bottle - Natural	250 mL	00070220142740	Green	No	
003	0083_SW127	HDPE (no PTFE)	20 mL	00352005019608	Grey	No	
003	0083_SW127	HDPE (no PTFE)	20 mL	00352005019441	Grey	No	

Total Bottle Count: ALS: 14, Non ALS: 1

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107094**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24445	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 24-Jun-2021 11:35	Issue Date	: 25-Jun-2021
Client Requested Due Date	: 08-Jul-2021	Scheduled Reporting Date	: **08-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 8.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107094-001	22-Jun-2021 09:35	0083_SW128_210622	✓	✓	✓	✓	✓	✓	✓
EP2107094-002	22-Jun-2021 09:37	0083_QC102_210622	✓	✓	✓	✓	✓	✓	✓
EP2107094-003	22-Jun-2021 09:54	0083_SW127_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107094-001	22-Jun-2021 09:35	0083_SW128_210622	✓
EP2107094-002	22-Jun-2021 09:37	0083_QC102_210622	✓
EP2107094-003	22-Jun-2021 09:54	0083_SW127_210622	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_QC102_210622	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_SW127_210622	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_SW128_210622	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107094**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021 11:35
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24445	Issue Date	: 07-Jul-2021 17:41
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW128_210622	0083_QC102_210622	0083_SW127_210622	----	----
			Sampling date / time	22-Jun-2021 09:35	22-Jun-2021 09:37	22-Jun-2021 09:54	----	----
Compound	CAS Number	LOR	Unit	EP2107094-001	EP2107094-002	EP2107094-003	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.69	7.70	7.82	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	10000	10000	16800	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	12	12	15	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	59	59	108	----	----
Total Alkalinity as CaCO3	----	1	mg/L	59	59	108	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1550	1500	2460	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3860	3870	6800	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	589	600	882	----	----
Magnesium	7439-95-4	1	mg/L	305	310	459	----	----
Sodium	7440-23-5	1	mg/L	2080	2130	3250	----	----
Potassium	7440-09-7	1	mg/L	118	118	188	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	142	142	245	----	----
ø Total Cations	----	0.01	meq/L	148	151	228	----	----
ø Ionic Balance	----	0.01	%	1.95	3.26	3.64	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	5	13	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW128_210622	0083_QC102_210622	0083_SW127_210622	----	----
				Sampling date / time	22-Jun-2021 09:35	22-Jun-2021 09:37	22-Jun-2021 09:54	----	----
Compound	CAS Number	LOR	Unit		EP2107094-001	EP2107094-002	EP2107094-003	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW128_210622	0083_QC102_210622	0083_SW127_210622	----	----
				Sampling date / time	22-Jun-2021 09:35	22-Jun-2021 09:37	22-Jun-2021 09:54	----	----
Compound	CAS Number	LOR	Unit		EP2107094-001	EP2107094-002	EP2107094-003	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**82.5**	**78.0**	**80.3**	----	----
13C8-PFOA	----	0.02	%		**84.0**	**84.1**	**82.6**	----	----

Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107094**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24445	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3771003)									
EP2107033-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.12	8.24	1.5	0% - 20%
EP2107092-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.54	7.54	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3762502)									
EP2107191-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	379	374	1.5	0% - 20%
EP2107092-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	5300	5120	3.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3762503)									
EP2107092-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	565	517	8.9	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3771002)									
EP2107033-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	647	629	2.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	647	629	2.7	0% - 20%
EP2107092-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	228	228	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	228	228	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757679)									
EP2107094-001	0083_SW128_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1550	1540	0.3	0% - 20%
EP2107184-008	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1230	1210	1.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3757680)									
EP2107094-001	0083_SW128_210622	ED045G: Chloride	16887-00-6	1	mg/L	3860	3960	2.8	0% - 20%
EP2107184-008	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	10700	10800	1.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3760593)									
EP2107086-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	539	571	5.8	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3760593) - continued									
EP2107086-001	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	1240	1320	6.1	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	9870	10500	6.2	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	560	593	5.6	0% - 20%
EP2107184-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	482	487	1.2	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1440	1440	0.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10500	10600	0.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	579	585	0.9	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3758251)									
EP2107033-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107094-003	0083_SW127_210622	EP002: Dissolved Organic Carbon	----	1	mg/L	13	14	0.0	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3769045)									
EP2107095-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107095-009	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3769045)									
EP2107095-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP2107095-009	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3769045) - continued									
EP2107095-009	Anonymous	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3769045)									
EP2107095-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107095-009	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3769045)									
EP2107095-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3769045) - continued									
EP2107095-001	Anonymous	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107095-009	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3769045)									
EP2107095-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
EP2107095-009	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3771003)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3762502)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	104	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3762503)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	104	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3771002)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	99.1	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757679)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	87.7	113
				<1	500 mg/L	97.7	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3757680)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3760593)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.5	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758251)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.4	73.2	116
				<1	100 mg/L	102	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3769045)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	85.0	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	93.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	80.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3769045) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	91.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	91.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3769045)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	81.0	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	95.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	90.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	92.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	96.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	99.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	91.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	89.2	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	80.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	84.9	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3769045)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	89.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	98.7	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	105	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	78.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	92.9	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	100	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3769045)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	92.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	100	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	99.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	91.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757679)							
EP2107094-001	0083_SW128_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3757680)							
EP2107094-001	0083_SW128_210622	ED045G: Chloride	16887-00-6	1000 mg/L	78.8	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758251)							
EP2107033-005	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3769045)							
EP2107095-007	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	88.6	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	104	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	78.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	93.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	92.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	83.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3769045)							
EP2107095-007	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	84.0	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	101	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	94.0	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	95.2	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	99.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	105	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	99.0	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	94.8	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	96.6	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	83.4	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	84.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3769045)							
EP2107095-007	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	95.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	91.4	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	106	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	86.6	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	95.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.4	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	95.4	61.0	135

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3769045)							
EP2107095-007	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	95.4	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	97.4	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	95.0	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	88.4	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107094**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 3
Order number	: DEF19009/0083	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107094--001	0083_SW128_210622	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	----	----	----	02-Jul-2021	22-Jun-2021	**10**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	22-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	06-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_SW128_210622, 0083_SW127_210622	0083_QC102_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

(ALS) COC#: **24449** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: NO 11:35 24/6/21	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No (N/A)

Free ice / frozen ice bricks present upon receipt? (Yes) No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_OTH108		22/06/2021 10:12 AM	Water	ALS: 7 Non ALS: 0	No	X			extra PFAS bottles for lab QC
002	0083_MW117_6.0-6.5		22/06/2021 10:31 AM	Water	ALS: 5 Non ALS: 0	No	X			
003	0083_OTH107		22/06/2021 10:52 AM	Water	ALS: 5 Non ALS: 0	No	X			
004	0083_MW115_8.5-9.0		22/06/2021 11:33 AM	Water	ALS: 5 Non ALS: 0	No	X			
005	0083_OTH106		22/06/2021 11:34 AM	Water	ALS: 5 Non ALS: 0	No	X			
006	0083_MW218		22/06/2021 12:13 PM	Water	ALS: 5 Non ALS: 0	No	X			
007	0083_MW217		22/06/2021 12:41 PM	Water	ALS: 7 Non ALS: 0	No	X			Extra PFAS bottles for lab QC
008	0083_MW116_4.5-5.0		22/06/2021 02:10 PM	Water	ALS: 5 Non ALS: 0	No	X			
009	0083_MW113_2.5-3.5		22/06/2021 03:02 PM	Water	ALS: 7 Non ALS: 0	No	X			Extra PFAS bottles for lab QC

CHAIN OF CUSTODY

ALS COC#: 24449 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 1135 24/6/21	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0083_MW114_2.0-3.0		22/06/2021 03:11 PM	Water	ALS: 5 Non ALS: 0	No	X			
011	0083_OTH105		22/06/2021 03:17 PM	Water	ALS: 5 Non ALS: 0	No	X			
012	0083_MW214		22/06/2021 03:35 PM	Water	ALS: 3 Non ALS: 0	No	Partial 4/8			
013	0083_MW017		22/06/2021 03:59 PM	Water	ALS: 6 Non ALS: 0	No	X			
014	0083_QC301		22/06/2021 04:34 PM	Water	ALS: 2 Non ALS: 0	No		X		
015	0083_QC302		22/06/2021 04:35 PM	Water	ALS: 2 Non ALS: 0	No		X		
016	0083_QC303		22/06/2021 04:36 PM	Water	ALS: 2 Non ALS: 0	No		X		
017	0083_QC401		22/06/2021 04:36 PM	Water	ALS: 2 Non ALS: 0	No		X		
018	0083_QC402		22/06/2021 04:37 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

ALS COC#: **24449** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 1135 24/6/21	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
019	0083_QC403		22/06/2021 04:38 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

(ALS) COC#: **24449** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
012	0083_MW214	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EP231X PFAS - Full Suite (28 analytes)

CHAIN OF CUSTODY

(ALS) COC#: **24449** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

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TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_OTH108	Clear Plastic Bottle - Natural	250 mL	00070220142695	Green	No	
001	0083_OTH108	Clear Plastic Bottle - Natural	250 mL	00070220142706	Green	No	
001	0083_OTH108	HDPE (no PTFE)	20 mL	00350019047515	Grey	No	
001	0083_OTH108	HDPE (no PTFE)	20 mL	00350019025647	Grey	No	
001	0083_OTH108	HDPE (no PTFE)	20 mL	00352005019378	Grey	No	
001	0083_OTH108	HDPE (no PTFE)	20 mL	00352005019657	Grey	No	
001	0083_OTH108	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002676	Purple	No	
002	0083_MW117_6.0-6.5	HDPE (no PTFE)	20 mL	00352005019878	Grey	No	
002	0083_MW117_6.0-6.5	HDPE (no PTFE)	20 mL	00352005019462	Grey	No	
002	0083_MW117_6.0-6.5	Clear Plastic Bottle - Natural	250 mL	00070220142710	Green	No	
002	0083_MW117_6.0-6.5	Clear Plastic Bottle - Natural	250 mL	00070220142716	Green	No	
002	0083_MW117_6.0-6.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020017427	Purple	No	
003	0083_OTH107	Clear Plastic Bottle - Natural	250 mL	00070220142711	Green	No	
003	0083_OTH107	Clear Plastic Bottle - Natural	250 mL	00070220142472	Green	No	
003	0083_OTH107	HDPE (no PTFE)	20 mL	00352010040114	Grey	No	
003	0083_OTH107	HDPE (no PTFE)	20 mL	00352010040039	Grey	No	
003	0083_OTH107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002593	Purple	No	
004	0083_MW114_8.5-9.0	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002656	Purple	No	
004	0083_MW114_8.5-9.0	HDPE (no PTFE)	20 mL	00352005019484	Grey	No	
004	0083_MW114_8.5-9.0	HDPE (no PTFE)	20 mL	00352010039942	Grey	No	
004	0083_MW114_8.5-9.0	Clear Plastic Bottle - Natural	250 mL	00070220142811	Green	No	
004	0083_MW114_8.5-9.0	Clear Plastic Bottle - Natural	250 mL	00070220142737	Green	No	
005	0083_OTH106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002712	Purple	No	
005	0083_OTH106	Clear Plastic Bottle - Natural	250 mL	00070220142004	Green	No	
005	0083_OTH106	Clear Plastic Bottle - Natural	250 mL	00070220142842	Green	No	
005	0083_OTH106	HDPE (no PTFE)	20 mL	00352010039968	Grey	No	

CHAIN OF CUSTODY

ALS COC#: **24449** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

010	0083_MW114_2.0-3.0	Clear Plastic Bottle - Natural	250 mL	00070220142672	Green	No	
010	0083_MW114_2.0-3.0	HDPE (no PTFE)	20 mL	00352005019663	Grey	No	
010	0083_MW114_2.0-3.0	HDPE (no PTFE)	20 mL	00352010040027	Grey	No	
011	0083_OTH105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002639	Purple	No	
011	0083_OTH105	HDPE (no PTFE)	20 mL	00352005019880	Grey	No	
011	0083_OTH105	HDPE (no PTFE)	20 mL	00352005019707	Grey	No	
011	0083_OTH105	Clear Plastic Bottle - Natural	250 mL	00070220142721	Green	No	
011	0083_OTH105	Clear Plastic Bottle - Natural	250 mL	00070220142762	Green	No	
012	0083_MW214	Clear Plastic Bottle - Natural	250 mL	00070220143144	Green	No	
012	0083_MW214	HDPE (no PTFE)	20 mL	00352010039993	Grey	No	
012	0083_MW214	HDPE (no PTFE)	20 mL	00352010039911	Grey	No	
013	0083_MW017	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003909	Purple	No	
013	0083_MW017	Clear Plastic Bottle - Natural	250 mL	00070220143103	Green	No	
013	0083_MW017	Clear Plastic Bottle - Natural	250 mL	00070220143171	Green	No	
013	0083_MW017	HDPE (no PTFE)	20 mL	00352010040259	Grey	No	
013	0083_MW017	Clear Plastic Bottle - Natural	250 mL	00070220143128	Green	No	
013	0083_MW017	HDPE (no PTFE)	20 mL	00352010040197	Grey	No	
014	0083_QC301	HDPE (no PTFE)	20 mL	00352010059076	Grey	No	
014	0083_QC301	HDPE (no PTFE)	20 mL	00352010058966	Grey	No	
015	0083_QC302	HDPE (no PTFE)	20 mL	00352010058956	Grey	No	
015	0083_QC302	HDPE (no PTFE)	20 mL	00352010058754	Grey	No	
016	0083_QC303	HDPE (no PTFE)	20 mL	00352010058971	Grey	No	
016	0083_QC303	HDPE (no PTFE)	20 mL	00352010059157	Grey	No	
017	0083_QC401	HDPE (no PTFE)	20 mL	00352010059001	Grey	No	
017	0083_QC401	HDPE (no PTFE)	20 mL	00352010058967	Grey	No	
018	0083_QC402	HDPE (no PTFE)	20 mL	00352010058974	Grey	No	
018	0083_QC402	HDPE (no PTFE)	20 mL	00352010059079	Grey	No	

CHAIN OF CUSTODY

COC#: **24449** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

019	0083_QC403	HDPE (no PTFE)	20 mL	00352010059151	Grey	No	
019	0083_QC403	HDPE (no PTFE)	20 mL	00352010058577	Grey	No	

Total Bottle Count: ALS: 82, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107095**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 4
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24449	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 24-Jun-2021 11:35	Issue Date	: 25-Jun-2021
Client Requested Due Date	: 08-Jul-2021	Scheduled Reporting Date	: **08-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 8.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 19 / 19

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2107095-002	: 22-Jun-2021 10:31	: 0083_MW117_6.0-6.5_210622
EP2107095-004	: 22-Jun-2021 11:33	: 0083_MW115_8.5-9.0_210622
EP2107095-008	: 22-Jun-2021 14:10	: 0083_MW116_4.5-5.0_210622
EP2107095-009	: 22-Jun-2021 15:02	: 0083_MW113_2.5-3.5_210622
EP2107095-010	: 22-Jun-2021 15:11	: 0083_MW114_2.0-3.0_210622

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107095-001	22-Jun-2021 10:12	0083_OTH108_210622	✓	✓	✓	✓	✓	✓	✓
EP2107095-002	22-Jun-2021 10:31	0083_MW117_6.0-6.5_2...	✓	✓	✓	✓	✓	✓	✓
EP2107095-003	22-Jun-2021 10:52	0083_OTH107_210622	✓	✓	✓	✓	✓	✓	✓
EP2107095-004	22-Jun-2021 11:33	0083_MW115_8.5-9.0_2...	✓	✓	✓	✓	✓	✓	✓
EP2107095-005	22-Jun-2021 11:34	0083_OTH106_210622	✓	✓	✓	✓	✓	✓	✓
EP2107095-006	22-Jun-2021 12:13	0083_MW218_210622	✓	✓	✓	✓	✓	✓	✓
EP2107095-007	22-Jun-2021 12:41	0083_MW217_210622	✓	✓	✓	✓	✓	✓	✓
EP2107095-008	22-Jun-2021 14:10	0083_MW116_4.5-5.0_2...	✓	✓	✓	✓	✓	✓	✓
EP2107095-009	22-Jun-2021 15:02	0083_MW113_2.5-3.5_2...	✓	✓	✓	✓	✓	✓	✓
EP2107095-010	22-Jun-2021 15:11	0083_MW114_2.0-3.0_2...	✓	✓	✓	✓	✓	✓	✓
EP2107095-011	22-Jun-2021 15:17	0083_OTH105_210622	✓	✓	✓	✓	✓	✓	✓
EP2107095-012	22-Jun-2021 15:35	0083_MW214_210622	✓	✓	✓				
EP2107095-013	22-Jun-2021 15:59	0083_MW017_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107095-001	22-Jun-2021 10:12	0083_OTH108_210622	✓
EP2107095-002	22-Jun-2021 10:31	0083_MW117_6.0-6.5_2...	✓
EP2107095-003	22-Jun-2021 10:52	0083_OTH107_210622	✓
EP2107095-004	22-Jun-2021 11:33	0083_MW115_8.5-9.0_2...	✓
EP2107095-005	22-Jun-2021 11:34	0083_OTH106_210622	✓
EP2107095-006	22-Jun-2021 12:13	0083_MW218_210622	✓

			WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107095-007	22-Jun-2021 12:41	0083_MW217_210622	✓
EP2107095-008	22-Jun-2021 14:10	0083_MW116_4.5-5.0_2...	✓
EP2107095-009	22-Jun-2021 15:02	0083_MW113_2.5-3.5_2...	✓
EP2107095-010	22-Jun-2021 15:11	0083_MW114_2.0-3.0_2...	✓
EP2107095-011	22-Jun-2021 15:17	0083_OTH105_210622	✓
EP2107095-012	22-Jun-2021 15:35	0083_MW214_210622	✓
EP2107095-013	22-Jun-2021 15:59	0083_MW017_210622	✓
EP2107095-014	22-Jun-2021 16:34	0083_QC301_210622	✓
EP2107095-015	22-Jun-2021 16:35	0083_QC302_210622	✓
EP2107095-016	22-Jun-2021 16:36	0083_QC303_210622	✓
EP2107095-017	22-Jun-2021 16:36	0083_QC401_210622	✓
EP2107095-018	22-Jun-2021 16:37	0083_QC402_210622	✓
EP2107095-019	22-Jun-2021 16:38	0083_QC403_210622	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0083_MW017_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW113_2.5-3.5	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW114_2.0-3.0	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW115_8.5-9.0	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW116_4.5-5.0	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW117_6.0-6.5	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW214_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW217_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW218_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH105_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH106_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH107_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH108_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107095**	Page	: 1 of 14
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021 11:35
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24449	Issue Date	: 06-Jul-2021 10:50
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 19		
No. of samples analysed	: 19		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW117_6.0-6.5_210622	0083_MW115_8.5-9.0_210622	0083_MW218_210622	0083_MW217_210622	0083_MW116_4.5-5.0_210622
				Sampling date / time	22-Jun-2021 10:31	22-Jun-2021 11:33	22-Jun-2021 12:13	22-Jun-2021 12:41	22-Jun-2021 14:10
Compound	CAS Number	LOR	Unit		EP2107095-002	EP2107095-004	EP2107095-006	EP2107095-007	EP2107095-008
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.72	7.76	7.76	7.65	7.72
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		41500	38400	18800	33800	42700
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		258	182	66	226	12
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		136	168	188	147	110
Total Alkalinity as CaCO3	----	1	mg/L		136	168	188	147	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2460	2250	962	1840	2310
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19700	17500	7640	15500	18800
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		493	472	245	415	458
Magnesium	7439-95-4	1	mg/L		1560	1460	575	1190	1460
Sodium	7440-23-5	1	mg/L		12000	11000	4250	9310	11200
Potassium	7440-09-7	1	mg/L		686	623	244	532	630
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		610	544	239	478	581
ø Total Cations	----	0.01	meq/L		692	638	251	537	646
ø Ionic Balance	----	0.01	%		6.36	7.98	2.32	5.78	5.35
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		3	6	3	3	2
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW117_6.0-6.5_210622	0083_MW115_8.5-9.0_210622	0083_MW218_210622	0083_MW217_210622	0083_MW116_4.5-5.0_210622
				Sampling date / time	22-Jun-2021 10:31	22-Jun-2021 11:33	22-Jun-2021 12:13	22-Jun-2021 12:41	22-Jun-2021 14:10
Compound	CAS Number	LOR	Unit		EP2107095-002	EP2107095-004	EP2107095-006	EP2107095-007	EP2107095-008
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW117_6.0-6.5_210622	0083_MW115_8.5-9.0_210622	0083_MW218_210622	0083_MW217_210622	0083_MW116_4.5-5.0_210622
				Sampling date / time	22-Jun-2021 10:31	22-Jun-2021 11:33	22-Jun-2021 12:13	22-Jun-2021 12:41	22-Jun-2021 14:10
					EP2107095-002	EP2107095-004	EP2107095-006	EP2107095-007	EP2107095-008
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**78.6**	**80.3**	**84.7**	**78.3**	**81.9**
13C8-PFOA	----	0.02	%		**80.4**	**83.4**	**82.1**	**83.7**	**82.2**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW113_2.5-3.5_210622	0083_MW114_2.0-3.0_210622	0083_OTH105_210622	0083_MW214_210622	0083_MW017_210622
				Sampling date / time	22-Jun-2021 15:02	22-Jun-2021 15:11	22-Jun-2021 15:17	22-Jun-2021 15:35	22-Jun-2021 15:59
Compound	CAS Number	LOR	Unit		EP2107095-009	EP2107095-010	EP2107095-011	EP2107095-012	EP2107095-013
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.73	7.66	7.98	8.06	7.69
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		38700	42900	40000	3410	21200
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		2620	3880	44	18	<5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		133	157	117	----	281
Total Alkalinity as CaCO3	----	1	mg/L		133	157	117	----	281
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2330	2420	2490	----	1410
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		17900	19300	19300	----	9340
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		491	390	462	----	316
Magnesium	7439-95-4	1	mg/L		1520	1220	1490	----	707
Sodium	7440-23-5	1	mg/L		11600	9040	11900	----	5100
Potassium	7440-09-7	1	mg/L		655	490	531	----	312
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		556	598	599	----	298
ø Total Cations	----	0.01	meq/L		671	526	677	----	304
ø Ionic Balance	----	0.01	%		9.36	6.44	6.14	----	0.88
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		2	7	4	----	9
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	0.04
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	0.05
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	0.04	0.98
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	0.17

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW113_2.5-3.5_210622	0083_MW114_2.0-3.0_210622	0083_OTH105_210622	0083_MW214_210622	0083_MW017_210622
				Sampling date / time	22-Jun-2021 15:02	22-Jun-2021 15:11	22-Jun-2021 15:17	22-Jun-2021 15:35	22-Jun-2021 15:59
Compound	CAS Number	LOR	Unit		EP2107095-009	EP2107095-010	EP2107095-011	EP2107095-012	EP2107095-013
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.02**	**9.72**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	**0.6**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**2.20**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**2.08**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.84**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	**0.54**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**0.04**
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW113_2.5-3.5_210622	0083_MW114_2.0-3.0_210622	0083_OTH105_210622	0083_MW214_210622	0083_MW017_210622
				Sampling date / time	22-Jun-2021 15:02	22-Jun-2021 15:11	22-Jun-2021 15:17	22-Jun-2021 15:35	22-Jun-2021 15:59
					EP2107095-009	EP2107095-010	EP2107095-011	EP2107095-012	EP2107095-013
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**5.06**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**0.81**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	**0.06**	**23.1**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.06**	**10.7**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	**0.06**	**22.9**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**84.1**	**86.0**	**80.9**	**83.1**	**82.7**
13C8-PFOA	----	0.02	%		**81.2**	**83.1**	**82.9**	**79.6**	**88.0**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_OTH108_210622	0083_OTH107_210622	0083_OTH106_210622	0083_QC301_210622	0083_QC302_210622
				Sampling date / time	22-Jun-2021 10:12	22-Jun-2021 10:52	22-Jun-2021 11:34	22-Jun-2021 16:34	22-Jun-2021 16:35
Compound	CAS Number	LOR	Unit		EP2107095-001	EP2107095-003	EP2107095-005	EP2107095-014	EP2107095-015
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.87	7.73	8.00	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		39300	40600	42400	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		8	174	82	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		119	129	118	----	----
Total Alkalinity as CaCO3	----	1	mg/L		119	129	118	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2510	2450	2420	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19900	19400	18800	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		491	492	468	----	----
Magnesium	7439-95-4	1	mg/L		1560	1550	1500	----	----
Sodium	7440-23-5	1	mg/L		12000	11900	11500	----	----
Potassium	7440-09-7	1	mg/L		676	670	647	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		616	601	583	----	----
ø Total Cations	----	0.01	meq/L		692	687	664	----	----
ø Ionic Balance	----	0.01	%		5.82	6.68	6.46	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		3	5	3	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_OTH108_210622	0083_OTH107_210622	0083_OTH106_210622	0083_QC301_210622	0083_QC302_210622
				Sampling date / time	22-Jun-2021 10:12	22-Jun-2021 10:52	22-Jun-2021 11:34	22-Jun-2021 16:34	22-Jun-2021 16:35
					EP2107095-001	EP2107095-003	EP2107095-005	EP2107095-014	EP2107095-015
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_OTH108_210622	0083_OTH107_210622	0083_OTH106_210622	0083_QC301_210622	0083_QC302_210622
				Sampling date / time	22-Jun-2021 10:12	22-Jun-2021 10:52	22-Jun-2021 11:34	22-Jun-2021 16:34	22-Jun-2021 16:35
					EP2107095-001	EP2107095-003	EP2107095-005	EP2107095-014	EP2107095-015
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**83.8**	**83.1**	**77.2**	**92.3**	**89.0**
13C8-PFOA	----	0.02	%		**83.6**	**82.9**	**80.5**	**102**	**102**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC303_210622	0083_QC401_210622	0083_QC402_210622	0083_QC403_210622	----
				Sampling date / time	22-Jun-2021 16:36	22-Jun-2021 16:36	22-Jun-2021 16:37	22-Jun-2021 16:38	----
Compound	CAS Number	LOR	Unit		EP2107095-016	EP2107095-017	EP2107095-018	EP2107095-019	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC303_210622	0083_QC401_210622	0083_QC402_210622	0083_QC403_210622	----
				Sampling date / time	22-Jun-2021 16:36	22-Jun-2021 16:36	22-Jun-2021 16:37	22-Jun-2021 16:38	----
Compound	CAS Number	LOR	Unit		EP2107095-016	EP2107095-017	EP2107095-018	EP2107095-019	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**84.3**	**93.8**	**90.5**	**86.7**	----
13C8-PFOA	----	0.02	%		**96.9**	**102**	**108**	**101**	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107095**	Page	: 1 of 10
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24449	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 19		
No. of samples analysed	: 19		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3771003)									
EP2107033-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.12	8.24	1.5	0% - 20%
EP2107092-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.54	7.54	0.0	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3771005)									
EP2107095-006	0083_MW218_210622	EA005-P: pH Value	----	0.01	pH Unit	7.76	7.82	0.8	0% - 20%
EP2107186-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.00	8.02	0.2	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3760091)									
EP2107033-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	30500	29600	3.2	0% - 20%
EP2107095-004	0083_MW115_8.5-9.0_210622	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	38400	37900	1.2	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3760092)									
EP2107033-007	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	156	150	3.4	0% - 20%
EP2107095-008	0083_MW116_4.5-5.0_210622	EA025H: Suspended Solids (SS)	----	5	mg/L	12	8	36.1	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3771002)									
EP2107033-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	647	629	2.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	647	629	2.7	0% - 20%
EP2107092-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	228	228	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	228	228	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3771004)									
EP2107095-006	0083_MW218_210622	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 3771004) - continued									
EP2107095-006	0083_MW218_210622	ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	188	188	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	188	188	0.0	0% - 20%
EP2107186-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	181	177	2.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	181	177	2.3	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757676)									
EP2107033-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	96	96	0.0	0% - 20%
EP2107033-008	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1830	1840	0.3	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3757677)									
EP2107033-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	134	134	0.0	0% - 20%
EP2107033-008	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	14000	13900	0.7	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3760603)									
EP2107095-001	0083_OTH108_210622	ED093F: Calcium	7440-70-2	1	mg/L	491	478	2.7	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1560	1520	2.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	12000	11700	2.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	676	653	3.4	0% - 20%
EP2107095-011	0083_OTH105_210622	ED093F: Calcium	7440-70-2	1	mg/L	462	474	2.6	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1490	1530	2.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11900	12200	2.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	531	547	3.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3758251)									
EP2107033-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107094-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	13	14	0.0	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3758252)									
EP2107095-010	0083_MW114_2.0-3.0_210622	EP002: Dissolved Organic Carbon	----	1	mg/L	7	7	0.0	No Limit
EP2107184-007	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	5	5	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3769045)									
EP2107095-001	0083_OTH108_210622	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107095-009	0083_MW113_2.5-3.5_210622	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3769045) - continued									
EP2107095-009	0083_MW113_2.5-3.5_210622	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3769045)									
EP2107095-001	0083_OTH108_210622	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP2107095-009	0083_MW113_2.5-3.5_210622	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3769045)									
EP2107095-001	0083_OTH108_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3769045) - continued									
EP2107095-001	0083_OTH108_210622	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107095-009	0083_MW113_2.5-3.5_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3769045)									
EP2107095-001	0083_OTH108_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107095-009	0083_MW113_2.5-3.5_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3769045)									
EP2107095-001	0083_OTH108_210622	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
EP2107095-009	0083_MW113_2.5-3.5_210622	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3771003)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3771005)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3760091)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	102	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3760092)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	103	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3771002)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	99.1	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3771004)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	98.1	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757676)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	107	87.7	113
				<1	500 mg/L	99.6	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3757677)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	100	87.9	114
				<1	1000 mg/L	102	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3760603)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
ED093F: Dissolved Major Cations (QCLot: 3760603) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	107	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758251)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.4	73.2	116
				<1	100 mg/L	102	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758252)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.2	73.2	116
				<1	100 mg/L	106	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3769045)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	85.0	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	93.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	80.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	91.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	91.6	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3771733)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	82.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	80.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	77.8	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	110	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3769045)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	81.0	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	95.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	90.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	92.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	96.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	99.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	91.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	89.2	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	80.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	84.9	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3771733)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	96.6	72.0	129

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3771733) - continued								
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	106	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	126	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	103	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	122	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	127	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	96.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3769045)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	89.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	98.7	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	105	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	78.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	92.9	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	100	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3771733)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	103	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	112	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	106	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	101	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	102	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	107	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	107	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3769045)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	92.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	100	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	99.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	91.2	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3771733)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	105	63.0	143

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3771733) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	93.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	91.4	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	83.4	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757676)							
EP2107033-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	96.6	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3757677)							
EP2107033-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	103	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758251)							
EP2107033-005	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758252)							
EP2107095-011	0083_OTH105_210622	EP002: Dissolved Organic Carbon	----	100 mg/L	106	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3769045)							
EP2107095-007	0083_MW217_210622	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	88.6	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	104	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	78.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	93.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	92.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	83.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3769045)							
EP2107095-007	0083_MW217_210622	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	84.0	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	101	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	94.0	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	95.2	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	99.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	105	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	99.0	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	94.8	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	96.6	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	83.4	65.0	144

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3769045) - continued							
EP2107095-007	0083_MW217_210622	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	84.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3769045)							
EP2107095-007	0083_MW217_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	95.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	91.4	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	106	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	86.6	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	95.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.4	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	95.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3769045)							
EP2107095-007	0083_MW217_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	95.4	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	97.4	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	95.0	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	88.4	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107095**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 19
Order number	: DEF19009/0083	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_OTH108_210622,	0083_MW117_6.0-6.5_210622,	----	----	----	02-Jul-2021	22-Jun-2021	**10**
0083_OTH107_210622,	0083_MW115_8.5-9.0_210622,						
0083_OTH106_210622,	0083_MW218_210622,						
0083_MW217_210622,	0083_MW116_4.5-5.0_210622,						
0083_MW113_2.5-3.5_210622,	0083_MW114_2.0-3.0_210622,						
0083_OTH105_210622,	0083_MW214_210622,						
0083_MW017_210622							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	39	5.13	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	39	2.56	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0083_OTH108_210622,	0083_MW117_6.0-6.5_210622,	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	22-Jun-2021	×
0083_OTH107_210622,	0083_MW115_8.5-9.0_210622,							
0083_OTH106_210622,	0083_MW218_210622,							
0083_MW217_210622,	0083_MW116_4.5-5.0_210622,							
0083_MW113_2.5-3.5_210622,	0083_MW114_2.0-3.0_210622,							
0083_OTH105_210622,	0083_MW214_210622,							
0083_MW017_210622								

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW214_210622, 0083_MW017_210622	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	29-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW214_210622, 0083_MW017_210622	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	29-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW017_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	06-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW017_210622	**22-Jun-2021**	**----**	----	----	**05-Jul-2021**	20-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW017_210622	**22-Jun-2021**	**----**	----	----	**05-Jul-2021**	20-Jul-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_OTH108_210622,	0083_MW117_6.0-6.5_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
0083_OTH107_210622,	0083_MW115_8.5-9.0_210622,							
0083_OTH106_210622,	0083_MW218_210622,							
0083_MW217_210622,	0083_MW116_4.5-5.0_210622,							
0083_MW113_2.5-3.5_210622,	0083_MW114_2.0-3.0_210622,							
0083_OTH105_210622,	0083_MW017_210622							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_OTH108_210622,	0083_MW117_6.0-6.5_210622,	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	20-Jul-2021	✓
0083_OTH107_210622,	0083_MW115_8.5-9.0_210622,							
0083_OTH106_210622,	0083_MW218_210622,							
0083_MW217_210622,	0083_MW116_4.5-5.0_210622,							
0083_MW113_2.5-3.5_210622,	0083_MW114_2.0-3.0_210622,							
0083_OTH105_210622,	0083_MW017_210622							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_OTH108_210622,	0083_MW117_6.0-6.5_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0083_OTH107_210622,	0083_MW115_8.5-9.0_210622,							
0083_OTH106_210622,	0083_MW218_210622,							
0083_MW217_210622,	0083_MW116_4.5-5.0_210622,							
0083_MW113_2.5-3.5_210622,	0083_MW114_2.0-3.0_210622,							
0083_OTH105_210622,	0083_MW214_210622,							
0083_MW017_210622,	0083_QC301_210622,							
0083_QC302_210622,	0083_QC303_210622,							
0083_QC401_210622,	0083_QC402_210622,							
0083_QC403_210622								
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_OTH108_210622,	0083_MW117_6.0-6.5_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0083_OTH107_210622,	0083_MW115_8.5-9.0_210622,							
0083_OTH106_210622,	0083_MW218_210622,							
0083_MW217_210622,	0083_MW116_4.5-5.0_210622,							
0083_MW113_2.5-3.5_210622,	0083_MW114_2.0-3.0_210622,							
0083_OTH105_210622,	0083_MW214_210622,							
0083_MW017_210622,	0083_QC301_210622,							
0083_QC302_210622,	0083_QC303_210622,							
0083_QC401_210622,	0083_QC402_210622,							
0083_QC403_210622								

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW214_210622, 0083_MW017_210622, 0083_QC301_210622, 0083_QC302_210622, 0083_QC303_210622, 0083_QC401_210622, 0083_QC402_210622, 0083_QC403_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW214_210622, 0083_MW017_210622, 0083_QC301_210622, 0083_QC302_210622, 0083_QC303_210622, 0083_QC401_210622, 0083_QC402_210622, 0083_QC403_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_OTH108_210622, 0083_MW117_6.0-6.5_210622, 0083_OTH107_210622, 0083_MW115_8.5-9.0_210622, 0083_OTH106_210622, 0083_MW218_210622, 0083_MW217_210622, 0083_MW116_4.5-5.0_210622, 0083_MW113_2.5-3.5_210622, 0083_MW114_2.0-3.0_210622, 0083_OTH105_210622, 0083_MW214_210622, 0083_MW017_210622, 0083_QC301_210622, 0083_QC302_210622, 0083_QC303_210622, 0083_QC401_210622, 0083_QC402_210622, 0083_QC403_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	**5.13**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	39	**2.56**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

COC#: **24442** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_MW134		22/06/2021 09:13 AM	Water	ALS: 4 Non ALS: 1	No	X		TOC filtered
002	0083_MW130		22/06/2021 09:41 AM	Water	ALS: 5 Non ALS: 0	No	X		
003	0083_OTH113		22/06/2021 10:11 AM	Water	ALS: 4 Non ALS: 1	No	X		TOC filtered
004	0083_MW129		22/06/2021 10:38 AM	Water	ALS: 5 Non ALS: 0	No	X		
005	0083_MW008		22/06/2021 12:33 PM	Water	ALS: 5 Non ALS: 0	No	X		
006	0083_MW003		22/06/2021 01:00 PM	Water	ALS: 5 Non ALS: 0	No	X		
007	0083_QC104		22/06/2021 01:01 PM	Water	ALS: 4 Non ALS: 1	No	X		DOC filtered
008	0083_MW105		22/06/2021 02:24 PM	Water	ALS: 5 Non ALS: 0	No	X		
009	0083_MW210		22/06/2021 02:25 PM	Water	ALS: 5 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: 24442 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW134	Clear Plastic Bottle - Natural	250 mL	00070220142989	Green	No	
001	0083_MW134	Clear Plastic Bottle - Natural	250 mL	00070220143155	Green	No	
001	0083_MW134	HDPE (no PTFE)	20 mL	00352010040447	Grey	No	
001	0083_MW134	HDPE (no PTFE)	20 mL	00352010040106	Grey	No	
002	0083_MW130	Clear Plastic Bottle - Natural	250 mL	00070220186619	Green	No	
002	0083_MW130	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002692	Purple	No	
002	0083_MW130	Clear Plastic Bottle - Natural	250 mL	00070220186513	Green	No	
002	0083_MW130	HDPE (no PTFE)	20 mL	00352005019740	Grey	No	
002	0083_MW130	HDPE (no PTFE)	20 mL	00352005019818	Grey	No	
003	0083_OTH113	Clear Plastic Bottle - Natural	250 mL	00070220143214	Green	No	
003	0083_OTH113	Clear Plastic Bottle - Natural	250 mL	00070220143003	Green	No	
003	0083_OTH113	HDPE (no PTFE)	20 mL	00352010040176	Grey	No	
003	0083_OTH113	HDPE (no PTFE)	20 mL	00352010040328	Grey	No	
004	0083_MW129	Amber TOC Vial - Sulfuric Acid	40 mL	00181020003933	Purple	No	
004	0083_MW129	HDPE (no PTFE)	20 mL	00352010040228	Grey	No	
004	0083_MW129	HDPE (no PTFE)	20 mL	00352010040432	Grey	No	
004	0083_MW129	Clear Plastic Bottle - Natural	250 mL	00070220143166	Green	No	
004	0083_MW129	Clear Plastic Bottle - Natural	250 mL	00070220143121	Green	No	
005	0083_MW008	Clear Plastic Bottle - Natural	250 mL	00070220186547	Green	No	
005	0083_MW008	Clear Plastic Bottle - Natural	250 mL	00070220186579	Green	No	
005	0083_MW008	HDPE (no PTFE)	20 mL	00352010040265	Grey	No	
005	0083_MW008	HDPE (no PTFE)	20 mL	00352005019382	Grey	No	
005	0083_MW008	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002648	Purple	No	
006	0083_MW003	Clear Plastic Bottle - Natural	250 mL	00070220142944	Green	No	
006	0083_MW003	Clear Plastic Bottle - Natural	250 mL	00070220142927	Green	No	
006	0083_MW003	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002471	Purple	No	

CHAIN OF CUSTODY

COC#: **24442** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

006	0083_MW003	HDPE (no PTFE)	20 mL	00352005019664	Grey	No	
006	0083_MW003	HDPE (no PTFE)	20 mL	00352005019793	Grey	No	
007	0083_QC104	Clear Plastic Bottle - Natural	250 mL	00070220186523	Green	No	
007	0083_QC104	Clear Plastic Bottle - Natural	250 mL	00070220186710	Green	No	
007	0083_QC104	HDPE (no PTFE)	20 mL	00352005019906	Grey	No	
007	0083_QC104	HDPE (no PTFE)	20 mL	00352010039955	Grey	No	
008	0083_MW105	Clear Plastic Bottle - Natural	250 mL	00070220186612	Green	No	
008	0083_MW105	Clear Plastic Bottle - Natural	250 mL	00070220186678	Green	No	
008	0083_MW105	HDPE (no PTFE)	20 mL	00352005019689	Grey	No	
008	0083_MW105	HDPE (no PTFE)	20 mL	00352005019827	Grey	No	
008	0083_MW105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002705	Purple	No	
009	0083_MW210	Clear Plastic Bottle - Natural	250 mL	00070220186596	Green	No	
009	0083_MW210	Clear Plastic Bottle - Natural	250 mL	00070220186730	Green	No	
009	0083_MW210	HDPE (no PTFE)	20 mL	00352005019842	Grey	No	
009	0083_MW210	HDPE (no PTFE)	20 mL	00352005019573	Grey	No	
009	0083_MW210	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002598	Purple	No	
010	0083_MW212	Clear Plastic Bottle - Natural	250 mL	00070220186705	Green	No	
010	0083_MW212	Clear Plastic Bottle - Natural	250 mL	00070220186578	Green	No	
010	0083_MW212	HDPE (no PTFE)	20 mL	00352005019413	Grey	No	
010	0083_MW212	HDPE (no PTFE)	20 mL	00352005019630	Grey	No	
010	0083_MW212	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002631	Purple	No	
011	0083_QC105	Clear Plastic Bottle - Natural	250 mL	00070220186615	Green	No	
011	0083_QC105	Clear Plastic Bottle - Natural	250 mL	00070220186695	Green	No	
011	0083_QC105	HDPE (no PTFE)	20 mL	00352005019489	Grey	No	
011	0083_QC105	HDPE (no PTFE)	20 mL	00352005019632	Grey	No	
011	0083_QC105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003943	Purple	No	
012	0083_MW103	Clear Plastic Bottle - Natural	250 mL	00070220143059	Green	No	

CHAIN OF CUSTODY

COC#: **24442** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

012	0083_MW103	Clear Plastic Bottle - Natural	250 mL	00070220143184	Green	No	
012	0083_MW103	HDPE (no PTFE)	20 mL	00352010040183	Grey	No	
012	0083_MW103	HDPE (no PTFE)	20 mL	00352010040056	Grey	No	
012	0083_MW103	HDPE (no PTFE)	20 mL	00352010040128	Grey	No	
012	0083_MW103	HDPE (no PTFE)	20 mL	00352010039996	Grey	No	
013	0083_QC106	Clear Plastic Bottle - Natural	250 mL	00070220143212	Green	No	
013	0083_QC106	Clear Plastic Bottle - Natural	250 mL	00070220143136	Green	No	
013	0083_QC106	HDPE (no PTFE)	20 mL	00350019165759	Grey	No	
013	0083_QC106	HDPE (no PTFE)	20 mL	00350019165904	Grey	No	
014	0083_MW102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003979	Purple	No	
014	0083_MW102	HDPE (no PTFE)	20 mL	00350019112648	Grey	No	
014	0083_MW102	HDPE (no PTFE)	20 mL	00350019112593	Grey	No	
014	0083_MW102	HDPE (no PTFE)	20 mL	00352010040074	Grey	No	
014	0083_MW102	HDPE (no PTFE)	20 mL	00352010040069	Grey	No	
014	0083_MW102	Clear Plastic Bottle - Natural	250 mL	00070220143174	Green	No	
014	0083_MW102	Clear Plastic Bottle - Natural	250 mL	00070220143038	Green	No	

Total Bottle Count: ALS: 69, Non ALS: 5

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107184**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 4
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24442	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 24-Jun-2021 11:35	Issue Date	: 25-Jun-2021
Client Requested Due Date	: 08-Jul-2021	Scheduled Reporting Date	: **08-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 8.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 16 / 16

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107184-001	22-Jun-2021 09:13	0083_MW134_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-002	22-Jun-2021 09:41	0083_MW130_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-003	22-Jun-2021 10:11	0083_OTH113_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-004	22-Jun-2021 10:38	0083_MW129_210622	✓	✓	✓	✓		✓	✓
EP2107184-005	22-Jun-2021 12:33	0083_MW008_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-006	22-Jun-2021 13:00	0083_MW003_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-007	22-Jun-2021 13:01	0083_QC104_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-008	22-Jun-2021 14:24	0083_MW105_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-009	22-Jun-2021 14:25	0083_MW210_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-010	22-Jun-2021 14:26	0083_MW212_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-011	22-Jun-2021 14:27	0083_QC105_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-012	22-Jun-2021 15:33	0083_MW103_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-013	22-Jun-2021 15:34	0083_QC106_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-014	22-Jun-2021 15:58	0083_MW102_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-015	22-Jun-2021 00:00	0083_QC107_210622	✓	✓	✓	✓	✓	✓	✓
EP2107184-016	22-Jun-2021 00:00	0083_MW104_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107184-001	22-Jun-2021 09:13	0083_MW134_210622		✓
EP2107184-002	22-Jun-2021 09:41	0083_MW130_210622		✓
EP2107184-003	22-Jun-2021 10:11	0083_OTH113_210622		✓
EP2107184-004	22-Jun-2021 10:38	0083_MW129_210622	✓	✓
EP2107184-005	22-Jun-2021 12:33	0083_MW008_210622		✓
EP2107184-006	22-Jun-2021 13:00	0083_MW003_210622		✓
EP2107184-007	22-Jun-2021 13:01	0083_QC104_210622		✓
EP2107184-008	22-Jun-2021 14:24	0083_MW105_210622		✓

			WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107184-009	22-Jun-2021 14:25	0083_MW210_210622		✓
EP2107184-010	22-Jun-2021 14:26	0083_MW212_210622		✓
EP2107184-011	22-Jun-2021 14:27	0083_QC105_210622		✓
EP2107184-012	22-Jun-2021 15:33	0083_MW103_210622		✓
EP2107184-013	22-Jun-2021 15:34	0083_QC106_210622		✓
EP2107184-014	22-Jun-2021 15:58	0083_MW102_210622		✓
EP2107184-015	22-Jun-2021 00:00	0083_QC107_210622		✓
EP2107184-016	22-Jun-2021 00:00	0083_MW104_210622		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0083_MW003_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW008_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW102_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW103_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW104_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW105_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW129_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW130_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW134_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW210_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW212_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH113_2106	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_QC104_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_QC105_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_QC106_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_QC107_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107184**	Page	: 1 of 15
Amendment	: **1**		
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021 11:35
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24442	Issue Date	: 16-Jul-2021 14:56
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 16		
No. of samples analysed	: 16		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Amendment (16/07/2021): This report has been amended following a change to the EP231 result reported for sample #10, #11 due to an unknown spot contamination. A full investigation will be detailed in a corrective action request.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW134_210622	0083_MW130_210622	0083_OTH113_210622	0083_MW129_210622	0083_MW008_210622
				Sampling date / time	22-Jun-2021 09:13	22-Jun-2021 09:41	22-Jun-2021 10:11	22-Jun-2021 10:38	22-Jun-2021 12:33
					EP2107184-001	EP2107184-002	EP2107184-003	EP2107184-004	EP2107184-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.58	7.54	8.06	7.53	7.73
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		30600	38500	41100	37400	21300
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		269	4180	32	61700	451
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		184	326	113	308	218
Total Alkalinity as CaCO3	----	1	mg/L		184	326	113	308	218
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1670	2150	2350	2000	1380
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		13900	18700	19800	18200	10500
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		465	482	480	539	294
Magnesium	7439-95-4	1	mg/L		1060	1440	1540	1390	784
Sodium	7440-23-5	1	mg/L		8900	10500	11800	10800	5590
Potassium	7440-09-7	1	mg/L		505	579	665	572	306
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		430	579	610	561	329
ø Total Cations	----	0.01	meq/L		510	614	681	626	330
ø Ionic Balance	----	0.01	%		8.49	2.96	5.52	5.43	0.14
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		4	9	2	----	3
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	----	----	30	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW134_210622	0083_MW130_210622	0083_OTH113_210622	0083_MW129_210622	0083_MW008_210622
				Sampling date / time	22-Jun-2021 09:13	22-Jun-2021 09:41	22-Jun-2021 10:11	22-Jun-2021 10:38	22-Jun-2021 12:33
					EP2107184-001	EP2107184-002	EP2107184-003	EP2107184-004	EP2107184-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	**0.02**	**0.03**	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	**0.54**	**0.72**	**0.08**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	**0.02**	**0.03**	**0.06**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	**0.03**	**0.06**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW134_210622	0083_MW130_210622	0083_OTH113_210622	0083_MW129_210622	0083_MW008_210622
				Sampling date / time	22-Jun-2021 09:13	22-Jun-2021 09:41	22-Jun-2021 10:11	22-Jun-2021 10:38	22-Jun-2021 12:33
					EP2107184-001	EP2107184-002	EP2107184-003	EP2107184-004	EP2107184-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	**0.08**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	**0.58**	**0.81**	**0.28**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	**0.56**	**0.75**	**0.08**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	**0.58**	**0.81**	**0.28**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**82.3**	**79.2**	**78.5**	**81.4**	**75.7**
13C8-PFOA	----	0.02	%		**84.1**	**82.3**	**81.2**	**84.0**	**81.7**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW003_210622	0083_QC104_210622	0083_MW105_210622	0083_MW210_210622	0083_MW212_210622
				Sampling date / time	22-Jun-2021 13:00	22-Jun-2021 13:01	22-Jun-2021 14:24	22-Jun-2021 14:25	22-Jun-2021 14:26
Compound	CAS Number	LOR	Unit		EP2107184-006	EP2107184-007	EP2107184-008	EP2107184-009	EP2107184-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.71	7.77	7.69	7.71	7.73
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		20000	18700	21300	18800	22400
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		285	273	393	93	51
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		245	238	244	265	216
Total Alkalinity as CaCO3	----	1	mg/L		245	238	244	265	216
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1260	1330	1230	1070	1230
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		10200	10500	10700	9100	12200
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		304	290	288	289	297
Magnesium	7439-95-4	1	mg/L		759	683	789	689	797
Sodium	7440-23-5	1	mg/L		5370	4820	5480	4910	5850
Potassium	7440-09-7	1	mg/L		295	267	309	276	326
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		319	329	332	284	374
ø Total Cations	----	0.01	meq/L		319	287	326	292	343
ø Ionic Balance	----	0.01	%		0.01	6.73	1.02	1.30	4.30
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		5	5	8	4	3
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		0.04	0.03	<0.02	<0.02	0.03
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW003_210622	0083_QC104_210622	0083_MW105_210622	0083_MW210_210622	0083_MW212_210622
				Sampling date / time	22-Jun-2021 13:00	22-Jun-2021 13:01	22-Jun-2021 14:24	22-Jun-2021 14:25	22-Jun-2021 14:26
					EP2107184-006	EP2107184-007	EP2107184-008	EP2107184-009	EP2107184-010
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.05**	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.06**	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.05**	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.01**	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_MW003_210622	0083_QC104_210622	0083_MW105_210622	0083_MW210_210622	0083_MW212_210622
				Sampling date / time	22-Jun-2021 13:00	22-Jun-2021 13:01	22-Jun-2021 14:24	22-Jun-2021 14:25	22-Jun-2021 14:26
					EP2107184-006	EP2107184-007	EP2107184-008	EP2107184-009	EP2107184-010
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.21**	**0.03**	<0.01	<0.01	**0.03**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.04**	**0.03**	<0.01	<0.01	**0.03**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.21**	**0.03**	<0.01	<0.01	**0.03**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**78.0**	**80.8**	**79.1**	**82.4**	**78.5**
13C8-PFOA	----	0.02	%		**84.0**	**84.7**	**81.8**	**86.6**	**82.8**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_QC105_210622	0083_MW103_210622	0083_QC106_210622	0083_MW102_210622	0083_QC107_210622
				Sampling date / time	22-Jun-2021 14:27	22-Jun-2021 15:33	22-Jun-2021 15:34	22-Jun-2021 15:58	22-Jun-2021 00:00
Compound	CAS Number	LOR	Unit		EP2107184-011	EP2107184-012	EP2107184-013	EP2107184-014	EP2107184-015
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.74	7.71	7.66	7.80	7.80
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		24100	11600	15900	8200	12300
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		29	378	546	150	2600
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		226	284	288	231	283
Total Alkalinity as CaCO3	----	1	mg/L		226	284	288	231	283
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1420	1020	1250	496	905
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		12100	6790	8960	3950	6220
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		319	226	261	143	235
Magnesium	7439-95-4	1	mg/L		891	404	544	268	428
Sodium	7440-23-5	1	mg/L		6510	3020	4310	2010	3100
Potassium	7440-09-7	1	mg/L		361	185	218	123	188
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		375	218	284	126	200
ø Total Cations	----	0.01	meq/L		382	181	251	120	187
ø Ionic Balance	----	0.01	%		0.82	9.48	6.29	2.68	3.45
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		3	9	8	29	5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	0.09	0.09	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	0.08	0.08	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		0.02	0.50	0.52	0.31	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_QC105_210622	0083_MW103_210622	0083_QC106_210622	0083_MW102_210622	0083_QC107_210622
				Sampling date / time	22-Jun-2021 14:27	22-Jun-2021 15:33	22-Jun-2021 15:34	22-Jun-2021 15:58	22-Jun-2021 00:00
					EP2107184-011	EP2107184-012	EP2107184-013	EP2107184-014	EP2107184-015
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.09**	**0.09**	**0.05**	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	**0.4**	**0.5**	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**1.48**	**1.55**	**0.80**	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	**1.21**	**1.29**	**0.60**	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.27**	**0.28**	**0.43**	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.04**	**0.04**	**0.10**	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_QC105_210622	0083_MW103_210622	0083_QC106_210622	0083_MW102_210622	0083_QC107_210622
				Sampling date / time	22-Jun-2021 14:27	22-Jun-2021 15:33	22-Jun-2021 15:34	22-Jun-2021 15:58	22-Jun-2021 00:00
					EP2107184-011	EP2107184-012	EP2107184-013	EP2107184-014	EP2107184-015
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	**0.11**	**0.11**	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.02**	**4.27**	**4.55**	**2.29**	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.02**	**0.59**	**0.61**	**0.36**	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.02**	**4.19**	**4.47**	**2.29**	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**78.9**	**91.8**	**96.3**	**99.6**	**95.5**
13C8-PFOA	----	0.02	%		**80.7**	**89.5**	**92.5**	**96.4**	**92.8**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW104_210622	----	----	----	----
				Sampling date / time	22-Jun-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107184-016	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.80**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**10400**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**3630**	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**257**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**257**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**934**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**4810**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**189**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**393**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**2660**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**173**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**160**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**162**	----	----	----	----
ø Ionic Balance	----	0.01	%		**0.51**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**6**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW104_210622	----	----	----	----
			Sampling date / time		22-Jun-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107184-016	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW104_210622	----	----	----	----
				Sampling date / time	22-Jun-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107184-016	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**100**	----	----	----	----
13C8-PFOA	----	0.02	%		**95.7**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107184**	Page	: 1 of 10
Amendment	: **1**		
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24442	Issue Date	: 16-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 16		
No. of samples analysed	: 16		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3772347)									
EP2107184-008	0083_MW105_210622	EA005-P: pH Value	----	0.01	pH Unit	7.69	7.69	0.0	0% - 20%
EP2107175-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.56	8.56	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3762909)									
EP2107184-009	0083_MW210_210622	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	18800	18800	0.1	0% - 20%
EP2107184-001	0083_MW134_210622	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	30600	29800	2.7	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3762910)									
EP2107184-011	0083_QC105_210622	EA025H: Suspended Solids (SS)	----	5	mg/L	29	24	18.0	No Limit
EP2107184-001	0083_MW134_210622	EA025H: Suspended Solids (SS)	----	5	mg/L	269	309	13.9	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3772345)									
EP2107184-008	0083_MW105_210622	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	244	244	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	244	244	0.0	0% - 20%
EP2107175-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	122	113	7.8	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2140	2150	0.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	2260	2260	0.1	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757679)									
EP2107094-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1550	1540	0.3	0% - 20%
EP2107184-008	0083_MW105_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1230	1210	1.1	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761927)									
EP2107184-015	0083_QC107_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	905	915	1.0	0% - 20%
EP2107274-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2270	2340	3.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3757680)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED045G: Chloride by Discrete Analyser (QC Lot: 3757680) - continued									
EP2107094-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	3860	3960	2.8	0% - 20%
EP2107184-008	0083_MW105_210622	ED045G: Chloride	16887-00-6	1	mg/L	10700	10800	1.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761926)									
EP2107184-015	0083_QC107_210622	ED045G: Chloride	16887-00-6	1	mg/L	6220	6270	0.7	0% - 20%
EP2107274-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19300	19200	0.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3760593)									
EP2107086-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	539	571	5.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1240	1320	6.1	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	9870	10500	6.2	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	560	593	5.6	0% - 20%
EP2107184-002	0083_MW130_210622	ED093F: Calcium	7440-70-2	1	mg/L	482	487	1.2	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1440	1440	0.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10500	10600	0.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	579	585	0.9	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3760594)									
EP2107184-012	0083_MW103_210622	ED093F: Calcium	7440-70-2	1	mg/L	226	225	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	404	403	0.3	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	3020	3010	0.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	185	188	1.2	0% - 20%
EP2107334-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	28	28	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3758252)									
EP2107095-010	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	7	7	0.0	No Limit
EP2107184-007	0083_QC104_210622	EP002: Dissolved Organic Carbon	----	1	mg/L	5	5	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3758133)									
EP2107184-004	0083_MW129_210622	EP005: Total Organic Carbon	----	1	mg/L	30	31	0.0	No Limit
EP2107283-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3770207)									
EP2107184-012	0083_MW103_210622	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.09	0.09	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.09	0.10	10.9	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	0.09	17.2	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.50	0.54	8.5	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107185-006	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3770207) - continued									
EP2107185-006	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3770207)									
EP2107184-012	0083_MW103_210622	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	1.48	1.58	7.1	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.21	1.20	1.6	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.27	0.26	5.0	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.4	0.5	0.0	No Limit
EP2107185-006	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3770207)									
EP2107184-012	0083_MW103_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3770207) - continued									
EP2107185-006	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3770207)									
EP2107184-012	0083_MW103_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.11	0.10	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107185-006	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3770207)									
EP2107184-012	0083_MW103_210622	EP231X: Sum of PFAS	----	0.01	µg/L	4.27	4.50	5.2	0% - 20%
EP2107185-006	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3772347)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3762909)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	105	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3762910)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	116	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3772345)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	99.9	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757679)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	87.7	113
				<1	500 mg/L	97.7	87.7	113
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761927)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.0	87.7	113
				<1	500 mg/L	96.8	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3757680)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	87.9	114
				<1	1000 mg/L	105	87.9	114
ED045G: Chloride by Discrete Analyser (QCLot: 3761926)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	101	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3760593)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.5	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3760594)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	104	85.9	113

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
ED093F: Dissolved Major Cations (QCLot: 3760594) - continued								
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	107	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758252)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.2	73.2	116
				<1	100 mg/L	106	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3758133)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	102	87.2	116
				<1	100 mg/L	99.8	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3770204)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	80.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	93.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	87.4	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	81.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	77.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	102	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3770207)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	87.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	83.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	79.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	86.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	94.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	83.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770204)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	80.7	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	89.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	84.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	87.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	90.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	99.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	87.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	82.8	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	79.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	74.8	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	80.7	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770207)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	88.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	129

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770207) - continued								
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	99.0	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	96.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	102	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	96.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	100	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	88.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3770204)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	96.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	97.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	82.9	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	80.0	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	88.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	89.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	83.6	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3770207)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	103	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	106	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	92.3	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	93.6	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	98.2	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	106	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	101	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3770204)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	90.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	99.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	94.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	106	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3770207)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3770207) - continued								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	117	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	109	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	108	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757679)							
EP2107094-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761927)							
EP2107184-015	0083_QC107_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3757680)							
EP2107094-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	78.8	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761926)							
EP2107184-015	0083_QC107_210622	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758252)							
EP2107095-011	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	106	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3758133)							
EP2107242-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	105	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3770207)							
EP2107184-014	0083_MW102_210622	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	98.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.4	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	78.4	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	93.8	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	101	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	94.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770207)							
EP2107184-014	0083_MW102_210622	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	122	73.0	129

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770207) - continued							
EP2107184-014	0083_MW102_210622	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	119	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	107	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	111	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	118	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	108	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	108	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	108	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	116	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	102	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	94.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3770207)							
EP2107184-014	0083_MW102_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	112	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	112	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	102	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	102	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	112	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	113	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	106	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3770207)							
EP2107184-014	0083_MW102_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	110	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	110	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	122	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	83.6	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107184**	Page	: 1 of 10
Amendment	: **1**		
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 16-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 16
Order number	: DEF19009/0083	No. of samples analysed	: 16

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107094--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107184--015	0083_QC107_210622	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2107184--015	0083_QC107_210622	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW134_210622,	0083_MW130_210622,	----	----	----	03-Jul-2021	22-Jun-2021	**11**
0083_OTH113_210622,	0083_MW129_210622,						
0083_MW008_210622,	0083_MW003_210622,						
0083_QC104_210622,	0083_MW105_210622,						
0083_MW210_210622,	0083_MW212_210622,						
0083_QC105_210622,	0083_MW103_210622,						
0083_QC106_210622,	0083_MW102_210622,						
0083_QC107_210622,	0083_MW104_210622						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	38	5.26	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	38	2.63	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0083_MW134_210622,	0083_MW130_210622,	**22-Jun-2021**	**----**	----	----	**03-Jul-2021**	22-Jun-2021	×
0083_OTH113_210622,	0083_MW129_210622,							
0083_MW008_210622,	0083_MW003_210622,							
0083_QC104_210622,	0083_MW105_210622,							
0083_MW210_210622,	0083_MW212_210622,							
0083_QC105_210622,	0083_MW103_210622,							
0083_QC106_210622,	0083_MW102_210622,							
0083_QC107_210622,	0083_MW104_210622							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0083_MW134_210622,	0083_MW130_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
0083_OTH113_210622,	0083_MW129_210622,							
0083_MW008_210622,	0083_MW003_210622,							
0083_QC104_210622,	0083_MW105_210622,							
0083_MW210_210622,	0083_MW212_210622,							
0083_QC105_210622,	0083_MW103_210622,							
0083_QC106_210622,	0083_MW102_210622,							
0083_QC107_210622,	0083_MW104_210622							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_MW134_210622,	0083_MW130_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
0083_OTH113_210622,	0083_MW129_210622,							
0083_MW008_210622,	0083_MW003_210622,							
0083_QC104_210622,	0083_MW105_210622,							
0083_MW210_210622,	0083_MW212_210622,							
0083_QC105_210622,	0083_MW103_210622,							
0083_QC106_210622,	0083_MW102_210622,							
0083_QC107_210622,	0083_MW104_210622							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**----**	----	----	**03-Jul-2021**	06-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	20-Jul-2021	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
0083_MW129_210622	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_MW134_210622, 0083_MW130_210622, 0083_OTH113_210622, 0083_MW129_210622, 0083_MW008_210622, 0083_MW003_210622, 0083_QC104_210622, 0083_MW105_210622, 0083_MW210_210622, 0083_MW212_210622, 0083_QC105_210622, 0083_MW103_210622, 0083_QC106_210622, 0083_MW102_210622, 0083_QC107_210622, 0083_MW104_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	**5.26**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	**12.50**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	**12.50**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	16	**6.25**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	38	**2.63**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

COC#: **24443** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_MW107		22/06/2021 09:23 AM	Water	ALS: 6 Non ALS: 0	No	X	extra for qc	
002	0083_OTH002		22/06/2021 09:26 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0083_QC103		22/06/2021 09:30 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0083_oth103		22/06/2021 09:35 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0083_MW111		22/06/2021 10:23 AM	Water	ALS: 4 Non ALS: 0	No	X		
006	0083_OTH104		22/06/2021 10:52 AM	Water	ALS: 6 Non ALS: 0	No	X	extra for qc	
007	0083_MW112		22/06/2021 10:55 AM	Water	ALS: 3 Non ALS: 1	No	X	filtered doc vial	
008	0083_MW202		22/06/2021 11:38 AM	Water	ALS: 4 Non ALS: 0	No	X		
009	0083_OTH102		22/06/2021 11:41 AM	Water	ALS: 4 Non ALS: 0	No	X		

CHAIN OF CUSTODY

COC#: **24443** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard Info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comments:			

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0083_OTH101		22/06/2021 11:52 AM	Water	ALS: 4 Non ALS: 0	No	X		
011	0083_OTH109		22/06/2021 11:54 AM	Water	ALS: 4 Non ALS: 0	No	X		
012	0083_OTH110		22/06/2021 11:58 AM	Water	ALS: 4 Non ALS: 0	No	X		
013	0083_MW110		22/06/2021 01:58 PM	Water	ALS: 5 Non ALS: 0	No	X		
014	0083_MW109		22/06/2021 02:00 PM	Water	ALS: 4 Non ALS: 1	No	X	filtered vial	

CHAIN OF CUSTODY

ALS COC#: 24443 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW107	HDPE (no PTFE)	20 mL	00350019112591	Grey	No	
001	0083_MW107	HDPE (no PTFE)	20 mL	00350019165719	Grey	No	
001	0083_MW107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056263	Purple	No	
001	0083_MW107	HDPE (no PTFE)	20 mL	00352005016253	Grey	No	
001	0083_MW107	HDPE (no PTFE)	20 mL	00352005016242	Grey	No	
001	0083_MW107	Clear Plastic Bottle - Natural	250 mL	00070719042504	Green	No	
002	0083_OTH002	HDPE (no PTFE)	20 mL	00352005016333	Grey	No	
002	0083_OTH002	HDPE (no PTFE)	20 mL	00352005016212	Grey	No	
002	0083_OTH002	Clear Plastic Bottle - Natural	250 mL	00070719042770	Green	No	
002	0083_OTH002	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056518	Purple	No	
003	0083_QC103	Clear Plastic Bottle - Natural	250 mL	00070519143709	Green	No	
003	0083_QC103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003949	Purple	No	
003	0083_QC103	HDPE (no PTFE)	20 mL	00352005019706	Grey	No	
003	0083_QC103	HDPE (no PTFE)	20 mL	00352005019523	Grey	No	
004	0083_oth103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056398	Purple	No	
004	0083_oth103	HDPE (no PTFE)	20 mL	00352005016065	Grey	No	
004	0083_oth103	HDPE (no PTFE)	20 mL	00352005016320	Grey	No	
004	0083_oth103	Clear Plastic Bottle - Natural	250 mL	00070719042783	Green	No	
005	0083_MW111	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023444	Purple	No	
005	0083_MW111	Clear Plastic Bottle - Natural	250 mL	00070719042966	Green	No	
005	0083_MW111	HDPE (no PTFE)	20 mL	00350019106823	Grey	No	
005	0083_MW111	HDPE (no PTFE)	20 mL	00350019106798	Grey	No	
006	0083_OTH104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003924	Purple	No	
006	0083_OTH104	Clear Plastic Bottle - Natural	250 mL	00070519144115	Green	No	
006	0083_OTH104	HDPE (no PTFE)	20 mL	00352005019747	Grey	No	
006	0083_OTH104	HDPE (no PTFE)	20 mL	00352005019391	Grey	No	

CHAIN OF CUSTODY

ALS COC#: 24443 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

006	0083_OTH104	HDPE (no PTFE)	20 mL	00350019165684	Grey	No	
006	0083_OTH104	HDPE (no PTFE)	20 mL	00350019165903	Grey	No	
007	0083_MW112	Clear Plastic Bottle - Natural	250 mL	00070519189631	Green	No	
007	0083_MW112	HDPE (no PTFE)	20 mL	00352010040006	Grey	No	
007	0083_MW112	HDPE (no PTFE)	20 mL	00352005019904	Grey	No	
008	0083_MW202	Clear Plastic Bottle - Natural	250 mL	00070719042956	Green	No	
008	0083_MW202	HDPE (no PTFE)	20 mL	00350019106772	Grey	No	
008	0083_MW202	HDPE (no PTFE)	20 mL	00350019106873	Grey	No	
008	0083_MW202	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023675	Purple	No	
009	0083_OTH102	HDPE (no PTFE)	20 mL	00350019112603	Grey	No	
009	0083_OTH102	HDPE (no PTFE)	20 mL	00350019112595	Grey	No	
009	0083_OTH102	Clear Plastic Bottle - Natural	250 mL	00071119012726	Green	No	
009	0083_OTH102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023854	Purple	No	
010	0083_OTH101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220055984	Purple	No	
010	0083_OTH101	Clear Plastic Bottle - Natural	250 mL	00070719042898	Green	No	
010	0083_OTH101	HDPE (no PTFE)	20 mL	00352005016181	Grey	No	
010	0083_OTH101	HDPE (no PTFE)	20 mL	00352005016283	Grey	No	
011	0083_OTH109	Clear Plastic Bottle - Natural	250 mL	00070719042833	Green	No	
011	0083_OTH109	HDPE (no PTFE)	20 mL	00352005016096	Grey	No	
011	0083_OTH109	HDPE (no PTFE)	20 mL	00352005016152	Grey	No	
011	0083_OTH109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023438	Purple	No	
012	0083_OTH110	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003929	Purple	No	
012	0083_OTH110	Clear Plastic Bottle - Natural	250 mL	00070519144097	Green	No	
012	0083_OTH110	HDPE (no PTFE)	20 mL	00352005019915	Grey	No	
012	0083_OTH110	HDPE (no PTFE)	20 mL	00352005019530	Grey	No	
013	0083_MW110	HDPE (no PTFE)	20 mL	00352005019724	Grey	No	
013	0083_MW110	HDPE (no PTFE)	20 mL	00352005019492	Grey	No	

CHAIN OF CUSTODY

COC#: **24443** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

013	0083_MW110	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003910	Purple	No	
013	0083_MW110	Clear Plastic Bottle - Natural	250 mL	00070220142758	Green	No	
013	0083_MW110	Clear Plastic Bottle - Natural	250 mL	00070220142837	Green	No	
014	0083_MW109	HDPE (no PTFE)	20 mL	00352005019338	Grey	No	
014	0083_MW109	HDPE (no PTFE)	20 mL	00352005019684	Grey	No	
014	0083_MW109	Clear Plastic Bottle - Natural	250 mL	00070220142708	Green	No	
014	0083_MW109	Clear Plastic Bottle - Natural	250 mL	00070220142700	Green	No	

Total Bottle Count: ALS: 60, Non ALS: 2

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107185**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24443	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 24-Jun-2021 11:35	Issue Date	: 25-Jun-2021
Client Requested Due Date	: 08-Jul-2021	Scheduled Reporting Date	: **08-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 8.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 14 / 14

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107185-001	22-Jun-2021 09:23	0083_MW107_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-002	22-Jun-2021 09:26	0083_OTH002_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-003	22-Jun-2021 09:30	0083_QC103_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-004	22-Jun-2021 09:35	0083_oth103_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-005	22-Jun-2021 10:23	0083_MW111_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-006	22-Jun-2021 10:52	0083_OTH104_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-007	22-Jun-2021 10:55	0083_MW112_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-008	22-Jun-2021 11:38	0083_MW202_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-009	22-Jun-2021 11:41	0083_OTH102_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-010	22-Jun-2021 11:52	0083_OTH101_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-011	22-Jun-2021 11:54	0083_OTH109_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-012	22-Jun-2021 11:58	0083_OTH110_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-013	22-Jun-2021 13:58	0083_MW110_210622	✓	✓	✓	✓	✓	✓	✓
EP2107185-014	22-Jun-2021 14:00	0083_MW109_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107185-001	22-Jun-2021 09:23	0083_MW107_210622	✓
EP2107185-002	22-Jun-2021 09:26	0083_OTH002_210622	✓
EP2107185-003	22-Jun-2021 09:30	0083_QC103_210622	✓
EP2107185-004	22-Jun-2021 09:35	0083_oth103_210622	✓
EP2107185-005	22-Jun-2021 10:23	0083_MW111_210622	✓
EP2107185-006	22-Jun-2021 10:52	0083_OTH104_210622	✓
EP2107185-007	22-Jun-2021 10:55	0083_MW112_210622	✓
EP2107185-008	22-Jun-2021 11:38	0083_MW202_210622	✓
EP2107185-009	22-Jun-2021 11:41	0083_OTH102_210622	✓
EP2107185-010	22-Jun-2021 11:52	0083_OTH101_210622	✓

			WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107185-011	22-Jun-2021 11:54	0083_OTH109_210622	✓
EP2107185-012	22-Jun-2021 11:58	0083_OTH110_210622	✓
EP2107185-013	22-Jun-2021 13:58	0083_MW110_210622	✓
EP2107185-014	22-Jun-2021 14:00	0083_MW109_210622	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0083_MW107_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW109_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW110_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW111_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW112_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_MW202_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH002_2106	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH101_2106	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH102_2106	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_oth103_210622	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH104_2106	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH109_2106	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_OTH110_2106	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_QC103_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----

Requested Deliverables

CLAIRE ARMSTRONG
- A4 - AU Tax Invoice (INV) Email claire.armstrong@cardno.com.au

DERP LAB REPORTS
- EDI Format - ESDAT (ESDAT) Email derp.labreports@esdat.com.au

Laura Beames
- A4 - AU Tax Invoice (INV) Email laura.beames@cardno.com.au

MAELLE BOURDAIS
- *AU Certificate of Analysis - NATA (COA) Email maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC) Email maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT) Email maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB) Email maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107185**	Page	: 1 of 12
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021 11:35
Order number	: DEF19009/0083	Date Analysis Commenced	: 29-Jun-2021
C-O-C number	: 24443	Issue Date	: 07-Jul-2021 17:02
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 14		
No. of samples analysed	: 14		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW107_210622	0083_OTH002_210622	0083_QC103_210622	0083_oth103_210622	0083_MW111_210622
				Sampling date / time	22-Jun-2021 09:23	22-Jun-2021 09:26	22-Jun-2021 09:30	22-Jun-2021 09:35	22-Jun-2021 10:23
Compound	CAS Number	LOR	Unit		EP2107185-001	EP2107185-002	EP2107185-003	EP2107185-004	EP2107185-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.67	7.86	7.90	7.81	7.96
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		41800	39400	42700	42000	36300
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		11400	42	29	184	134
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		153	114	116	123	666
Total Alkalinity as CaCO3	----	1	mg/L		153	114	116	123	666
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2720	2700	2730	2700	2290
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19200	19000	19000	18900	18000
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		492	475	488	474	496
Magnesium	7439-95-4	1	mg/L		1520	1520	1540	1490	1440
Sodium	7440-23-5	1	mg/L		11700	11700	11800	11400	11000
Potassium	7440-09-7	1	mg/L		658	655	665	641	636
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		601	594	595	592	569
ø Total Cations	----	0.01	meq/L		675	674	681	658	638
ø Ionic Balance	----	0.01	%		5.80	6.30	6.76	5.34	5.74
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		5	3	2	4	9
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW107_210622	0083_OTH002_210622	0083_QC103_210622	0083_oth103_210622	0083_MW111_210622
				Sampling date / time	22-Jun-2021 09:23	22-Jun-2021 09:26	22-Jun-2021 09:30	22-Jun-2021 09:35	22-Jun-2021 10:23
Compound	CAS Number	LOR	Unit		EP2107185-001	EP2107185-002	EP2107185-003	EP2107185-004	EP2107185-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.05**	<0.01	<0.01	<0.01	**0.02**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW107_210622	0083_OTH002_210622	0083_QC103_210622	0083_oth103_210622	0083_MW111_210622
				Sampling date / time	22-Jun-2021 09:23	22-Jun-2021 09:26	22-Jun-2021 09:30	22-Jun-2021 09:35	22-Jun-2021 10:23
Compound	CAS Number	LOR	Unit		EP2107185-001	EP2107185-002	EP2107185-003	EP2107185-004	EP2107185-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.05**	<0.01	<0.01	<0.01	**0.02**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.05**	<0.01	<0.01	<0.01	**0.02**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.05**	<0.01	<0.01	<0.01	**0.02**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**98.8**	**97.0**	**103**	**99.5**	**96.1**
13C8-PFOA	----	0.02	%		**97.7**	**94.5**	**99.6**	**93.5**	**94.9**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH104_210622	0083_MW112_210622	0083_MW202_210622	0083_OTH102_210622	0083_OTH101_210622
				Sampling date / time	22-Jun-2021 10:52	22-Jun-2021 10:55	22-Jun-2021 11:38	22-Jun-2021 11:41	22-Jun-2021 11:52
Compound	CAS Number	LOR	Unit		EP2107185-006	EP2107185-007	EP2107185-008	EP2107185-009	EP2107185-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.99	7.76	7.64	8.03	8.04
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		42100	42300	38900	41000	41800
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		124	28	117	60	47
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		119	130	174	115	117
Total Alkalinity as CaCO3	----	1	mg/L		119	130	174	115	117
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2710	2680	2470	2680	2670
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19200	18800	18200	18800	18900
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		474	481	461	492	494
Magnesium	7439-95-4	1	mg/L		1500	1500	1490	1570	1560
Sodium	7440-23-5	1	mg/L		11500	11500	11300	12100	11900
Potassium	7440-09-7	1	mg/L		647	653	641	676	674
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		600	589	568	588	591
ø Total Cations	----	0.01	meq/L		664	664	654	697	688
ø Ionic Balance	----	0.01	%		5.02	6.04	6.98	8.47	7.57
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		<1	1	3	2	<1
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH104_210622	0083_MW112_210622	0083_MW202_210622	0083_OTH102_210622	0083_OTH101_210622
				Sampling date / time	22-Jun-2021 10:52	22-Jun-2021 10:55	22-Jun-2021 11:38	22-Jun-2021 11:41	22-Jun-2021 11:52
Compound	CAS Number	LOR	Unit		EP2107185-006	EP2107185-007	EP2107185-008	EP2107185-009	EP2107185-010
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	**0.04**	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0083_OTH104_210622	0083_MW112_210622	0083_MW202_210622	0083_OTH102_210622	0083_OTH101_210622
				Sampling date / time	22-Jun-2021 10:52	22-Jun-2021 10:55	22-Jun-2021 11:38	22-Jun-2021 11:41	22-Jun-2021 11:52
					EP2107185-006	EP2107185-007	EP2107185-008	EP2107185-009	EP2107185-010
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	**0.04**	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	**0.04**	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	**0.04**	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**96.5**	**101**	**95.7**	**97.2**	**100**
13C8-PFOA	----	0.02	%		**96.1**	**96.8**	**96.2**	**95.0**	**98.6**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_OTH109_210622	0083_OTH110_210622	0083_MW110_210622	0083_MW109_210622	----
			Sampling date / time	22-Jun-2021 11:54	22-Jun-2021 11:58	22-Jun-2021 13:58	22-Jun-2021 14:00	----
Compound	CAS Number	LOR	Unit	EP2107185-011	EP2107185-012	EP2107185-013	EP2107185-014	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.94	7.91	7.66	7.74	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	42300	41800	35100	42000	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	18	31	102	19	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	117	120	154	104	----
Total Alkalinity as CaCO3	----	1	mg/L	117	120	154	104	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2670	2680	2620	2660	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	18900	19100	18600	18900	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	452	462	466	448	----
Magnesium	7439-95-4	1	mg/L	1440	1460	1420	1440	----
Sodium	7440-23-5	1	mg/L	11000	11200	10800	11000	----
Potassium	7440-09-7	1	mg/L	613	622	605	614	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	591	597	582	591	----
ø Total Cations	----	0.01	meq/L	635	646	625	635	----
ø Ionic Balance	----	0.01	%	3.60	3.97	3.56	3.62	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	4	<1	23	<1	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH109_210622	0083_OTH110_210622	0083_MW110_210622	0083_MW109_210622	----
				Sampling date / time	22-Jun-2021 11:54	22-Jun-2021 11:58	22-Jun-2021 13:58	22-Jun-2021 14:00	----
Compound	CAS Number	LOR	Unit		EP2107185-011	EP2107185-012	EP2107185-013	EP2107185-014	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_OTH109_210622	0083_OTH110_210622	0083_MW110_210622	0083_MW109_210622	----
				Sampling date / time	22-Jun-2021 11:54	22-Jun-2021 11:58	22-Jun-2021 13:58	22-Jun-2021 14:00	----
Compound	CAS Number	LOR	Unit		EP2107185-011	EP2107185-012	EP2107185-013	EP2107185-014	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	<0.01	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**96.5**	**98.6**	**100**	**93.5**	----
13C8-PFOA	----	0.02	%		**93.6**	**97.7**	**96.7**	**92.5**	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107185**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 29-Jun-2021
C-O-C number	: 24443	Issue Date	: 07-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 14		
No. of samples analysed	: 14		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3772347)									
EP2107184-008	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.69	7.69	0.0	0% - 20%
EP2107175-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.56	8.56	0.0	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3772349)									
EP2107185-002	0083_OTH002_210622	EA005-P: pH Value	----	0.01	pH Unit	7.86	7.93	0.9	0% - 20%
EP2107185-012	0083_OTH110_210622	EA005-P: pH Value	----	0.01	pH Unit	7.91	7.91	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3762946)									
EP2107185-006	0083_OTH104_210622	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	42100	42300	0.4	0% - 20%
EP2107175-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6590	6480	1.7	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3762947)									
EP2107185-008	0083_MW202_210622	EA025H: Suspended Solids (SS)	----	5	mg/L	117	132	12.0	0% - 20%
EP2107175-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	7	29.8	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3772345)									
EP2107184-008	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	244	244	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	244	244	0.0	0% - 20%
EP2107175-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	122	113	7.8	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2140	2150	0.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	2260	2260	0.1	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3772348)									
EP2107185-002	0083_OTH002_210622	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	116	1.9	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 3772348) - continued									
EP2107185-002	0083_OTH002_210622	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	116	1.9	0% - 20%
EP2107185-012	0083_OTH110_210622	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	120	119	1.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	120	119	1.3	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761880)									
EP2107185-001	0083_MW107_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2720	2720	0.0	0% - 20%
EP2107185-011	0083_OTH109_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2670	2680	0.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761881)									
EP2107185-001	0083_MW107_210622	ED045G: Chloride	16887-00-6	1	mg/L	19200	19100	0.7	0% - 20%
EP2107185-011	0083_OTH109_210622	ED045G: Chloride	16887-00-6	1	mg/L	18900	19100	1.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3760603)									
EP2107095-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	491	478	2.7	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1560	1520	2.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	12000	11700	2.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	676	653	3.4	0% - 20%
EP2107095-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	462	474	2.6	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1490	1530	2.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11900	12200	2.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	531	547	3.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3760604)									
EP2107185-009	0083_OTH102_210622	ED093F: Calcium	7440-70-2	1	mg/L	492	473	3.9	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1570	1500	4.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	12100	11500	5.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	676	645	4.7	0% - 20%
EP2107344-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	41	41	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	41	41	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	140	139	0.9	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	27	27	0.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3771630)									
EP2107185-001	0083_MW107_210622	EP002: Dissolved Organic Carbon	----	1	mg/L	5	4	0.0	No Limit
EP2107185-011	0083_OTH109_210622	EP002: Dissolved Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3770207)									
EP2107184-012	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.09	0.09	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.09	0.10	10.9	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	0.09	17.2	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.50	0.54	8.5	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3770207) - continued									
EP2107185-006	0083_OTH104_210622	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3770207)									
EP2107184-012	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	1.48	1.58	7.1	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.21	1.20	1.6	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.27	0.26	5.0	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.4	0.5	0.0	No Limit
EP2107185-006	0083_OTH104_210622	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3770207)									
EP2107184-012	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3770207) - continued									
EP2107184-012	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107185-006	0083_OTH104_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3770207)									
EP2107184-012	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.11	0.10	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107185-006	0083_OTH104_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3770207)									
EP2107184-012	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	4.27	4.50	5.2	0% - 20%
EP2107185-006	0083_OTH104_210622	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3772347)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3772349)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3762946)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	105	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3762947)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	93.7	89.1	120
				<5	1000 mg/L	99.5	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3772345)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	99.9	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3772348)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	97.8	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761880)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	102	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3761881)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	94.5	87.9	114
				<1	1000 mg/L	95.0	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3760603)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
ED093F: Dissolved Major Cations (QCLot: 3760603) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	107	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.1	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3760604)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100.0	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	106	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3771630)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	96.3	73.2	116
				<1	100 mg/L	103	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3770207)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	87.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	83.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	79.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	86.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	94.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	83.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770207)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	88.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	99.0	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	96.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	102	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	96.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	100	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	88.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3770207)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	103	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	106	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	92.3	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	93.6	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	98.2	57.6	145

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3770207) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	106	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	101	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3770207)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	117	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	109	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	108	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761880)							
EP2107185-001	0083_MW107_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761881)							
EP2107185-001	0083_MW107_210622	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3771630)							
EP2107185-002	0083_OTH002_210622	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3770207)							
EP2107184-014	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	98.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.4	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	78.4	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	93.8	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	101	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	94.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770207)							
EP2107184-014	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	122	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	119	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	107	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	111	72.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3770207) - continued							
EP2107184-014	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	118	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	108	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	108	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	108	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	116	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	102	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	94.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3770207)							
EP2107184-014	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	112	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	112	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	102	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	102	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	112	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	113	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	106	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3770207)							
EP2107184-014	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	110	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	110	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	122	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	83.6	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107185**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 07-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 14
Order number	: DEF19009/0083	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107185--001	0083_MW107_210622	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2107185--001	0083_MW107_210622	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_MW107_210622,	0083_OTH002_210622,	----	----	----	03-Jul-2021	22-Jun-2021	**11**
0083_QC103_210622,	0083_oth103_210622,						
0083_MW111_210622,	0083_OTH104_210622,						
0083_MW112_210622,	0083_MW202_210622,						
0083_OTH102_210622,	0083_OTH101_210622,						
0083_OTH109_210622,	0083_OTH110_210622,						
0083_MW110_210622,	0083_MW109_210622						

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**03-Jul-2021**	22-Jun-2021	×
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**03-Jul-2021**	06-Jul-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	20-Jul-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_MW107_210622,	0083_OTH002_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0083_QC103_210622,	0083_oth103_210622,							
0083_MW111_210622,	0083_OTH104_210622,							
0083_MW112_210622,	0083_MW202_210622,							
0083_OTH102_210622,	0083_OTH101_210622,							
0083_OTH109_210622,	0083_OTH110_210622,							
0083_MW110_210622,	0083_MW109_210622							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

(ALS) COC#: **24457** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHA SW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SW120		22/06/2021 10:54 AM	Water	ALS: 5 Non ALS: 0	No	X		
002	0083_SW112		22/06/2021 11:33 AM	Water	ALS: 5 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: **24457** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHA SW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SW120	Clear Plastic Bottle - Natural	250 mL	00070220186519	Green	No	
001	0083_SW120	Clear Plastic Bottle - Natural	250 mL	00070220186379	Green	No	
001	0083_SW120	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002495	Purple	No	
001	0083_SW120	HDPE (no PTFE)	20 mL	00352005019609	Grey	No	
001	0083_SW120	HDPE (no PTFE)	20 mL	00352005019507	Grey	No	
002	0083_SW112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002661	Purple	No	
002	0083_SW112	Clear Plastic Bottle - Natural	250 mL	00070220186588	Green	No	
002	0083_SW112	Clear Plastic Bottle - Natural	250 mL	00070220186627	Green	No	
002	0083_SW112	HDPE (no PTFE)	20 mL	00352005019901	Grey	No	
002	0083_SW112	HDPE (no PTFE)	20 mL	00352005019466	Grey	No	

Total Bottle Count: ALS: 10, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107186**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24457	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 24-Jun-2021 11:35	Issue Date	: 25-Jun-2021
Client Requested Due Date	: 08-Jul-2021	Scheduled Reporting Date	: **08-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 8.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 2 / 2

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107186-001	22-Jun-2021 10:54	0083_SW120_210622	✓	✓	✓	✓	✓	✓	✓
EP2107186-002	22-Jun-2021 11:33	0083_SW112_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107186-001	22-Jun-2021 10:54	0083_SW120_210622	✓
EP2107186-002	22-Jun-2021 11:33	0083_SW112_210622	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_SW112_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0083_SW120_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107186**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021 11:35
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24457	Issue Date	: 07-Jul-2021 17:40
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW120_210622	0083_SW112_210622	----	----	----
				Sampling date / time	22-Jun-2021 10:54	22-Jun-2021 11:33	----	----	----
Compound	CAS Number	LOR	Unit		EP2107186-001	EP2107186-002	--------	--------	--------
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.74	8.00	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		19700	58800	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		133	42	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		69	181	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		69	181	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2450	4310	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		8670	26200	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		965	1150	----	----	----
Magnesium	7439-95-4	1	mg/L		551	2060	----	----	----
Sodium	7440-23-5	1	mg/L		4470	16400	----	----	----
Potassium	7440-09-7	1	mg/L		247	858	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		297	832	----	----	----
ø Total Cations	----	0.01	meq/L		294	962	----	----	----
ø Ionic Balance	----	0.01	%		0.46	7.23	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		16	14	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0083_SW120_210622	0083_SW112_210622	----	----	----
			Sampling date / time	22-Jun-2021 10:54	22-Jun-2021 11:33	----	----	----
Compound	CAS Number	LOR	Unit	EP2107186-001	EP2107186-002	--------	--------	--------
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW120_210622	0083_SW112_210622	----	----	----
				Sampling date / time	22-Jun-2021 10:54	22-Jun-2021 11:33	----	----	----
Compound	CAS Number	LOR	Unit		EP2107186-001	EP2107186-002	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**84.4**	**89.0**	----	----	----
13C8-PFOA	----	0.02	%		**108**	**106**	----	----	----

Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107186**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24457	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3771005)									
EP2107095-006	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.76	7.82	0.8	0% - 20%
EP2107186-002	0083_SW112_210622	EA005-P: pH Value	----	0.01	pH Unit	8.00	8.02	0.2	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3762946)									
EP2107185-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	42100	42300	0.4	0% - 20%
EP2107175-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6590	6480	1.7	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3762947)									
EP2107185-008	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	117	132	12.0	0% - 20%
EP2107175-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	7	29.8	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3771004)									
EP2107095-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	188	188	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	188	188	0.0	0% - 20%
EP2107186-002	0083_SW112_210622	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	181	177	2.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	181	177	2.3	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757679)									
EP2107094-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1550	1540	0.3	0% - 20%
EP2107184-008	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1230	1210	1.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3757680)									
EP2107094-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	3860	3960	2.8	0% - 20%
EP2107184-008	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	10700	10800	1.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3757346)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3757346) - continued									
EP2107025-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	123	120	2.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	228	224	1.8	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1840	1810	1.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	94	93	0.0	0% - 20%
EP2107234-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	372	393	5.6	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	17000	18000	5.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	96600	102000	5.9	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2220	2360	6.3	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3771630)									
EP2107185-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	5	4	0.0	No Limit
EP2107185-011	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	4	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3771005)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3762946)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	105	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3762947)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	93.7	89.1	120
				<5	1000 mg/L	99.5	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3771004)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	98.1	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757679)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	87.7	113
				<1	500 mg/L	97.7	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3757680)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3757346)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	105	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	106	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	109	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.6	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3771630)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	96.3	73.2	116
				<1	100 mg/L	103	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3771733)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	82.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	80.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	77.8	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3771733) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	110	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3771733)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	96.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	106	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	126	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	103	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	122	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	127	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	96.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3771733)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	103	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	112	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	106	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	101	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	102	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	107	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	107	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3771733)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	105	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	93.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	91.4	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	83.4	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757679)							
EP2107094-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3757680)							
EP2107094-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	78.8	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3771630)							
EP2107185-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107186**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 2
Order number	: DEF19009/0083	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107094--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0083_SW120_210622,	0083_SW112_210622	----	----	----	02-Jul-2021	22-Jun-2021	**10**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	22-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	06-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**07-Jul-2021**	20-Jul-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	29-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0083_SW120_210622,	0083_SW112_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

COC#: **24459** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC- DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD120		22/06/2021 10:55 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0083_SD126		22/06/2021 11:14 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0083_SD112		22/06/2021 11:32 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Wednesday, June 23, 2021 12:30:55 PM

CHAIN OF CUSTODY

ALS COC#: **24459** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC- DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais
PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:
QUOTE NO: SY/139/19

SAMPLER MOBILE:
/ ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD120	HDPE Soil Jar	200 mL	00620719063095	Grey	No	
001	0083_SD120	Soil Glass Jar - Unpreserved	150 mL	00260321005763	Orange	No	
002	0083_SD126	Soil Glass Jar - Unpreserved	150 mL	00260321005780	Orange	No	
002	0083_SD126	HDPE Soil Jar	200 mL	00620719063180	Grey	No	
003	0083_SD112	HDPE Soil Jar	200 mL	00620719063150	Grey	No	
003	0083_SD112	Soil Glass Jar - Unpreserved	150 mL	00260321005704	Orange	No	

Total Bottle Count: ALS: 6, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107187**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24459	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: SC- DEF19009/HEHA SED		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 24-Jun-2021 11:35	Issue Date	: 25-Jun-2021
Client Requested Due Date	: 06-Jul-2021	Scheduled Reporting Date	: **06-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 8.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2107187-001	22-Jun-2021 10:55	0083_SD120_210622	✓	✓	✓	✓
EP2107187-002	22-Jun-2021 11:14	0083_SD126_210622	✓	✓	✓	✓
EP2107187-003	22-Jun-2021 11:32	0083_SD112_210622	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

CLAIRE ARMSTRONG		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
Laura Beames		
- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107187**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021 11:35
Order number	: DEF19009/0083	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24459	Issue Date	: 07-Jul-2021 16:04
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: SC- DEF19009/HEHA SED		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD120_210622	0083_SD126_210622	0083_SD112_210622	----	----
			Sampling date / time	22-Jun-2021 10:55	22-Jun-2021 11:14	22-Jun-2021 11:32	----	----
Compound	CAS Number	LOR	Unit	EP2107187-001	EP2107187-002	EP2107187-003	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.3	8.4	8.8	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	8990	3880	5040	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	61.9	21.5	27.1	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	23.1	40.0	22.4	----	----
Exchangeable Magnesium	----	0.1	meq/100g	10.8	2.5	6.3	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.8	0.2	0.2	----	----
Exchangeable Sodium	----	0.1	meq/100g	2.6	0.2	0.7	----	----
Cation Exchange Capacity	----	0.1	meq/100g	37.4	42.9	29.7	----	----
Exchangeable Sodium Percent	----	0.1	%	6.9	0.4	2.3	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	11.0	2.4	3.8	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD120_210622	0083_SD126_210622	0083_SD112_210622	----	----
				Sampling date / time	22-Jun-2021 10:55	22-Jun-2021 11:14	22-Jun-2021 11:32	----	----
Compound	CAS Number	LOR	Unit		EP2107187-001	EP2107187-002	EP2107187-003	--------	--------
					Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD120_210622	0083_SD126_210622	0083_SD112_210622	----	----
			Sampling date / time	22-Jun-2021 10:55	22-Jun-2021 11:14	22-Jun-2021 11:32	----	----
Compound	CAS Number	LOR	Unit	EP2107187-001	EP2107187-002	EP2107187-003	--------	--------
				Result	Result	Result	----	----
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**91.5**	**88.0**	**92.0**	----	----
13C8-PFOA	----	0.0002	%	**82.0**	**80.0**	**80.5**	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107187**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24459	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: SC- DEF19009/HEHA SED		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		

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Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA002: pH 1:5 (Soils) (QC Lot: 3764010)									
EP2107093-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EP2107194-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3764009)									
EP2107093-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	1800	1800	0.4	0% - 20%
EP2107194-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	78	78	0.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3761416)									
EP2107026-001	Anonymous	EA055: Moisture Content	----	0.1	%	41.5	44.5	7.2	0% - 20%
EP2107034-003	Anonymous	EA055: Moisture Content	----	0.1	%	4.5	4.6	3.5	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3770345)									
EP2107026-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.9	2.2	16.1	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	14.0	13.7	2.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.4	4.7	6.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.3	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	19.0	19.1	0.0	0% - 20%
EP2107187-002	0083_SD126_210622	ED008: Exchangeable Sodium Percent	----	0.1	%	0.4	0.4	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	40.0	46.8	15.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.6	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	42.9	49.8	14.9	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3774236)									
EP2107275-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.5	0.5	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	16.9	16.4	3.2	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED008: Exchangeable Cations (QC Lot: 3774236) - continued									
EP2107275-002	Anonymous	ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.2	2.1	6.4	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	19.3	18.7	3.5	0% - 20%
EP004: Organic Matter (QC Lot: 3761397)									
EP2107026-001	Anonymous	EP004: Organic Matter	----	0.5	%	5.6	5.6	0.0	0% - 50%
EP2107034-004	Anonymous	EP004: Organic Matter	----	0.5	%	1.3	1.1	10.6	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3767628)									
EP2107093-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2107187-002	0083_SD126_210622	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3767628)									
EP2107093-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2107187-002	0083_SD126_210622	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3767628) - continued									
EP2107187-002	0083_SD126_210622	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3767628)									
EP2107093-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107187-002	0083_SD126_210622	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3767628)									
EP2107093-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107187-002	0083_SD126_210622	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3767628) - continued									
EP2107187-002	0083_SD126_210622	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3764010)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3764009)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	98.5	93.6	106
ED008: Exchangeable Cations (QCLot: 3770345)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	89.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	87.8	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	100	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	89.8	79.9	110
ED008: Exchangeable Cations (QCLot: 3774236)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	93.2	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	88.3	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100.0	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	101	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	93.3	79.9	110
EP004: Organic Matter (QCLot: 3761397)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	118	70.0	120
				<0.5	85 %	91.7	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3767628)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.8	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.8	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3767628)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	83.7	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	69.0	133

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3767628) - continued								
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.2	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	86.5	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3767628)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	97.0	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	81.1	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.3	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.4	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3767628)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	81.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	82.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	80.4	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	91.6	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3767628)							
EP2107093-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	74.8	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	82.4	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	77.2	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	76.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	75.6	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	120	59.0	134

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3767628)							
EP2107093-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	86.0	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	81.6	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	82.4	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	85.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	80.8	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	79.6	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	82.4	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	77.2	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	84.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	78.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	85.1	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3767628)							
EP2107093-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	87.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	98.1	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	83.3	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	87.0	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	83.0	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	90.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	78.4	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3767628)							
EP2107093-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	95.6	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	72.0	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	94.0	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	103	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107187**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 24-Jun-2021
Site	: SC- DEF19009/HEHA SED	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 3
Order number	: DEF19009/0083	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved							
0083_SD120_210622, 0083_SD112_210622	0083_SD126_210622,	01-Jul-2021	29-Jun-2021	**2**	----	----	----
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved							
0083_SD120_210622, 0083_SD112_210622	0083_SD126_210622,	01-Jul-2021	29-Jun-2021	**2**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0083_SD120_210622, 0083_SD112_210622	0083_SD126_210622,	**22-Jun-2021**	**01-Jul-2021**	29-Jun-2021	×	**01-Jul-2021**	01-Jul-2021	✓
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0083_SD120_210622, 0083_SD112_210622	0083_SD126_210622,	**22-Jun-2021**	**01-Jul-2021**	29-Jun-2021	×	**01-Jul-2021**	29-Jul-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0083_SD120_210622, 0083_SD112_210622	0083_SD126_210622,	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	06-Jul-2021	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0083_SD126_210622,	0083_SD112_210622	**22-Jun-2021**	**02-Jul-2021**	20-Jul-2021	✓	**02-Jul-2021**	20-Jul-2021	✓
Soil Glass Jar - Unpreserved (ED008)								
0083_SD120_210622		**22-Jun-2021**	**05-Jul-2021**	20-Jul-2021	✓	**05-Jul-2021**	20-Jul-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0083_SD120_210622, 0083_SD126_210622, 0083_SD112_210622	**22-Jun-2021**	**05-Jul-2021**	20-Jul-2021	✓	**05-Jul-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD120_210622, 0083_SD126_210622, 0083_SD112_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0083_SD120_210622, 0083_SD126_210622, 0083_SD112_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0083_SD120_210622, 0083_SD126_210622, 0083_SD112_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD120_210622, 0083_SD126_210622, 0083_SD112_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0083_SD120_210622, 0083_SD126_210622, 0083_SD112_210622	**22-Jun-2021**	**01-Jul-2021**	19-Dec-2021	✓	**01-Jul-2021**	10-Aug-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	3	27	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	27	**7.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	27	**7.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

CHAIN OF CUSTODY

ALS COC#: **24503** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_MW027		23/06/2021 08:17 AM	Water	ALS: 5 Non ALS: 0	No	X			
002	0083_MW019		23/06/2021 08:31 AM	Water	ALS: 7 Non ALS: 0	No	X			Extra PFAS bottles for lab QC
003	0083_MW213		23/06/2021 08:57 AM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8			
004	0083_MW101		23/06/2021 09:19 AM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8			
005	0083_MW119		23/06/2021 09:42 AM	Water	ALS: 5 Non ALS: 0	No	X			
006	0083_QC301		23/06/2021 05:11 PM	Water	ALS: 2 Non ALS: 0	No		X		
007	0083_QC401		23/06/2021 05:12 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

ALS COC#: **24503** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal Intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
003	0083_MW213	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)
004	0083_MW101	Ground Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)

CHAIN OF CUSTODY

ALS COC#: 24503 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

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SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_MW027	Clear Plastic Bottle - Natural	250 mL	00070220143128	Green	No	
001	0083_MW027	Clear Plastic Bottle - Natural	250 mL	00070220142680	Green	No	
001	0083_MW027	HDPE (no PTFE)	20 mL	00352005019680	Grey	No	
001	0083_MW027	HDPE (no PTFE)	20 mL	00352005019848	Grey	No	
001	0083_MW027	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002550	Purple	No	
002	0083_MW019	Clear Plastic Bottle - Natural	250 mL	00070220143107	Green	No	
002	0083_MW019	Clear Plastic Bottle - Natural	250 mL	00070220143097	Green	No	
002	0083_MW019	HDPE (no PTFE)	20 mL	00352010040509	Grey	No	
002	0083_MW019	HDPE (no PTFE)	20 mL	00352010040337	Grey	No	
002	0083_MW019	HDPE (no PTFE)	20 mL	00352005020589	Grey	No	
002	0083_MW019	HDPE (no PTFE)	20 mL	00352005005259	Grey	No	
002	0083_MW019	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003896	Purple	No	
003	0083_MW213	Clear Plastic Bottle - Natural	250 mL	00070220143089	Green	No	
003	0083_MW213	Clear Plastic Bottle - Natural	250 mL	00070220143072	Green	No	
003	0083_MW213	HDPE (no PTFE)	20 mL	00352010040185	Grey	No	
003	0083_MW213	HDPE (no PTFE)	20 mL	00352010040015	Grey	No	
004	0083_MW101	HDPE (no PTFE)	20 mL	00352010040230	Grey	No	
004	0083_MW101	Clear Plastic Bottle - Natural	250 mL	00070220143167	Green	No	
004	0083_MW101	HDPE (no PTFE)	20 mL	00352010040103	Grey	No	
004	0083_MW101	Clear Plastic Bottle - Natural	250 mL	00070220143094	Green	No	
005	0083_MW119	Clear Plastic Bottle - Natural	250 mL	00070220142929	Green	No	
005	0083_MW119	Clear Plastic Bottle - Natural	250 mL	00070220143225	Green	No	
005	0083_MW119	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003900	Purple	No	
005	0083_MW119	HDPE (no PTFE)	20 mL	00352010040169	Grey	No	
005	0083_MW119	HDPE (no PTFE)	20 mL	00352010040247	Grey	No	
006	0083_QC301	HDPE (no PTFE)	20 mL	00352010059036	Grey	No	

CHAIN OF CUSTODY

(ALS) COC#: **24503** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA GW

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

006	0083_QC301	HDPE (no PTFE)	20 mL	00352010058950	Grey	No	
007	0083_QC401	HDPE (no PTFE)	20 mL	00350019177493	Grey	No	
007	0083_QC401	HDPE (no PTFE)	20 mL	00352010059117	Grey	No	

Total Bottle Count: ALS: 29, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107188**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24503	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 28-Jun-2021 13:25	Issue Date	: 29-Jun-2021
Client Requested Due Date	: 09-Jul-2021	Scheduled Reporting Date	: **09-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 5	Temperature	: 15.9 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 7 / 7

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107188-001	23-Jun-2021 08:17	0083_MW027_210623	✓	✓	✓	✓	✓	✓	✓
EP2107188-002	23-Jun-2021 08:31	0083_MW019_210623	✓	✓	✓	✓	✓	✓	✓
EP2107188-003	23-Jun-2021 08:57	0083_MW213_210623	✓	✓	✓	✓		✓	✓
EP2107188-004	23-Jun-2021 09:19	0083_MW101_210623	✓	✓	✓	✓		✓	✓
EP2107188-005	23-Jun-2021 09:42	0083_MW119_210623	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107188-001	23-Jun-2021 08:17	0083_MW027_210623	✓
EP2107188-002	23-Jun-2021 08:31	0083_MW019_210623	✓
EP2107188-003	23-Jun-2021 08:57	0083_MW213_210623	✓
EP2107188-004	23-Jun-2021 09:19	0083_MW101_210623	✓
EP2107188-005	23-Jun-2021 09:42	0083_MW119_210623	✓
EP2107188-006	23-Jun-2021 17:11	0083_QC301_210623	✓
EP2107188-007	23-Jun-2021 17:12	0083_QC401_210623	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_MW019_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	×	----	----
0083_MW027_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	×	----	----
0083_MW101_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	×	----	----
0083_MW119_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	×	----	----
0083_MW213_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	×	----	----

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107188**	Page	: 1 of 8
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021 13:25
Order number	: DEF19009/0083	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24503	Issue Date	: 08-Jul-2021 17:39
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0083_MW027_210623	0083_MW019_210623	0083_MW213_210623	0083_MW101_210623	0083_MW119_210623
			Sampling date / time	23-Jun-2021 08:17	23-Jun-2021 08:31	23-Jun-2021 08:57	23-Jun-2021 09:19	23-Jun-2021 09:42
Compound	CAS Number	LOR	Unit	EP2107188-001	EP2107188-002	EP2107188-003	EP2107188-004	EP2107188-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.51	7.62	7.79	7.82	7.80
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	19100	21700	2740	14700	16700
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	189	38	22	355	89
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	356	317	471	772	272
Total Alkalinity as CaCO3	----	1	mg/L	356	317	471	772	272
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1240	1290	91	389	857
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	8770	9300	1360	7300	8010
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	341	286	130	182	214
Magnesium	7439-95-4	1	mg/L	730	718	119	542	604
Sodium	7440-23-5	1	mg/L	5580	5570	614	4020	4620
Potassium	7440-09-7	1	mg/L	304	306	49	213	265
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	280	296	49.7	229	249
ø Total Cations	----	0.01	meq/L	328	323	44.2	234	268
ø Ionic Balance	----	0.01	%	7.78	4.51	5.78	0.98	3.65
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	28	43	----	----	8
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	0.02	0.94
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	1.26
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.17	0.02	<0.02	0.31	7.73
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.07

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW027_210623	0083_MW019_210623	0083_MW213_210623	0083_MW101_210623	0083_MW119_210623
				Sampling date / time	23-Jun-2021 08:17	23-Jun-2021 08:31	23-Jun-2021 08:57	23-Jun-2021 09:19	23-Jun-2021 09:42
Compound	CAS Number	LOR	Unit		EP2107188-001	EP2107188-002	EP2107188-003	EP2107188-004	EP2107188-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.10**	<0.01	<0.01	<0.01	**0.11**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	**0.4**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	**1.04**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.03**	<0.02	<0.02	**0.29**	**2.99**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.04**	<0.02	<0.02	**0.23**	**0.26**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.05**	**0.16**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0083_MW027_210623	0083_MW019_210623	0083_MW213_210623	0083_MW101_210623	0083_MW119_210623
				Sampling date / time	23-Jun-2021 08:17	23-Jun-2021 08:31	23-Jun-2021 08:57	23-Jun-2021 09:19	23-Jun-2021 09:42
Compound	CAS Number	LOR	Unit		EP2107188-001	EP2107188-002	EP2107188-003	EP2107188-004	EP2107188-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.34**	**0.02**	<0.01	**0.90**	**15.0**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.27**	**0.02**	<0.01	**0.31**	**7.84**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.34**	**0.02**	<0.01	**0.90**	**13.6**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**89.2**	**78.5**	**85.5**	**90.6**	**85.7**
13C8-PFOA	----	0.02	%		**111**	**109**	**119**	**120**	**99.7**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC301_210623	0083_QC401_210623	----	----	----
				Sampling date / time	23-Jun-2021 17:11	23-Jun-2021 17:12	----	----	----
Compound	CAS Number	LOR	Unit		EP2107188-006	EP2107188-007	--------	--------	--------
					Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0083_QC301_210623	0083_QC401_210623	----	----	----
				Sampling date / time	23-Jun-2021 17:11	23-Jun-2021 17:12	----	----	----
Compound	CAS Number	LOR	Unit		EP2107188-006	EP2107188-007	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**84.6**	**85.3**	----	----	----
13C8-PFOA	----	0.02	%		**96.3**	**96.4**	----	----	----

Surrogate Control Limits

Sub-Matrix: **GROUNDWATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107188**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24503	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776024)									
EP2107188-002	0083_MW019_210623	EA005-P: pH Value	----	0.01	pH Unit	7.62	7.53	1.2	0% - 20%
EP2107189-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.33	7.33	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3764976)									
EP2107188-001	0083_MW027_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	19100	18800	1.7	0% - 20%
EP2107189-004	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	37600	37000	1.6	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3764977)									
EP2107188-001	0083_MW027_210623	EA025H: Suspended Solids (SS)	----	5	mg/L	189	205	8.0	0% - 20%
EP2107361-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3776023)									
EP2107188-002	0083_MW019_210623	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	317	318	0.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	317	318	0.4	0% - 20%
EP2107189-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	152	153	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	152	153	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764408)									
EP2107188-001	0083_MW027_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1240	1240	0.0	0% - 20%
EP2107270-006	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2260	2310	2.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3764409)									
EP2107188-001	0083_MW027_210623	ED045G: Chloride	16887-00-6	1	mg/L	8770	8780	0.2	0% - 20%
EP2107270-006	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	17900	18300	2.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762880)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3762880) - continued									
EP2107188-001	0083_MW027_210623	ED093F: Calcium	7440-70-2	1	mg/L	341	326	4.4	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	730	703	3.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5580	5420	3.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	304	296	2.5	0% - 20%
EP2107270-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	441	445	0.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1340	1360	1.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10300	10400	1.1	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	534	545	2.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3774022)									
EP2107188-001	0083_MW027_210623	EP002: Dissolved Organic Carbon	----	1	mg/L	28	25	12.9	0% - 20%
EP2107193-008	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	<2	2	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775220)									
EP2107188-002	0083_MW019_210623	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.02	0.03	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107189-012	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	20.8	23.2	10.9	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	9.03	10.0	10.5	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	6.80	7.83	14.1	0% - 20%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	25.5	29.3	14.1	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	3.06	3.23	5.4	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775220)									
EP2107188-002	0083_MW019_210623	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP2107189-012	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	1.63	1.75	7.0	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	1.95	2.18	11.0	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	9.77	11.6	17.4	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	1.10	1.20	9.0	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775220) - continued									
EP2107189-012	Anonymous	EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	1.5	1.8	20.8	0% - 50%
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775220)									
EP2107188-002	0083_MW019_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107189-012	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775220)									
EP2107188-002	0083_MW019_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775220) - continued									
EP2107188-002	0083_MW019_210623	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107189-012	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3775220)									
EP2107188-002	0083_MW019_210623	EP231X: Sum of PFAS	----	0.01	µg/L	0.02	0.03	40.0	No Limit
EP2107189-012	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	81.1	92.1	12.6	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3776024)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3764976)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	102	88.1	114
				<10	1000 mg/L	99.4	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3764977)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	103	89.1	120
				<5	1000 mg/L	99.0	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3776023)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	106	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764408)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	108	87.7	113
				<1	500 mg/L	105	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3764409)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	104	87.9	114
				<1	1000 mg/L	106	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3762880)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.8	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.6	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.4	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3774022)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.4	73.2	116
				<1	100 mg/L	102	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775220)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	96.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	81.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	74.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	75.4	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775220) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	91.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	90.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775220)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	90.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	89.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	85.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	110	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	113	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	93.0	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775220)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	110	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	109	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	91.7	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	103	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	100	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	114	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	109	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775220)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	105	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	101	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	82.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	109	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764408)							
EP2107188-001	0083_MW027_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3764409)							
EP2107188-001	0083_MW027_210623	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3774022)							
EP2107188-002	0083_MW019_210623	EP002: Dissolved Organic Carbon	----	100 mg/L	109	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775220)							
EP2107189-011	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	# Not Determined	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	# Not Determined	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	100	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	99.4	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775220)							
EP2107189-011	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	94.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	128	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	109	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	128	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	114	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	115	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	117	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	111	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	96.2	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775220)							
EP2107189-011	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	111	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	112	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	96.7	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	106	66.0	145

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775220) - continued							
EP2107189-011	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	81.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	118	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	102	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775220)							
EP2107189-011	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	97.0	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	97.8	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	93.8	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	123	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107188**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 7
Order number	: DEF19009/0083	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107188--001	0083_MW027_210623	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
ED045G: Chloride by Discrete Analyser	EP2107188--001	0083_MW027_210623	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	Anonymous	**Perfluorobutane sulfonic acid (PFBS)**	375-73-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	Anonymous	**Perfluoropentane sulfonic acid (PFPeS)**	2706-91-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	Anonymous	**Perfluorohexane sulfonic acid (PFHxS)**	355-46-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	EP2107189--011	Anonymous	**Perfluorohexanoic acid (PFHxA)**	307-24-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	----	----	----	06-Jul-2021	23-Jun-2021	**13**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**06-Jul-2021**	23-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**30-Jun-2021**	30-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**30-Jun-2021**	30-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**06-Jul-2021**	07-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**08-Jul-2021**	21-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**08-Jul-2021**	21-Jul-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**30-Jun-2021**	30-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW119_210623	**23-Jun-2021**	**----**	----	----	**05-Jul-2021**	21-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623, 0083_QC301_210623, 0083_QC401_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623, 0083_QC301_210623, 0083_QC401_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623, 0083_QC301_210623, 0083_QC401_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623, 0083_QC301_210623, 0083_QC401_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_MW027_210623, 0083_MW019_210623, 0083_MW213_210623, 0083_MW101_210623, 0083_MW119_210623, 0083_QC301_210623, 0083_QC401_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

COC#: **24509** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SW113

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SW113		23/06/2021 08:42 AM	Water	ALS: 5 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: **24509** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SW113

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SW113	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003955	Purple	No	
001	0083_SW113	Clear Plastic Bottle - Natural	250 mL	00070220143173	Green	No	
001	0083_SW113	Clear Plastic Bottle - Natural	250 mL	00070220143029	Green	No	
001	0083_SW113	HDPE (no PTFE)	20 mL	00352010040021	Grey	No	
001	0083_SW113	HDPE (no PTFE)	20 mL	00352010040223	Grey	No	

Total Bottle Count: ALS: 5, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107191**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24509	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 28-Jun-2021 13:25	Issue Date	: 29-Jun-2021
Client Requested Due Date	: 09-Jul-2021	Scheduled Reporting Date	: **09-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 5	Temperature	: 15.9 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107191-001	23-Jun-2021 08:42	0083_SW113_210623	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107191-001	23-Jun-2021 08:42	0083_SW113_210623	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER** Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0083_SW113_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	×	----	----

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107191**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021 13:25
Order number	: DEF19009/0083	Date Analysis Commenced	: 29-Jun-2021
C-O-C number	: 24509	Issue Date	: 08-Jul-2021 12:09
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW113_210623	----	----	----	----
				Sampling date / time	23-Jun-2021 08:42	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107191-001	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.84**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**379**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**80**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**80**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**56**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**72**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**44**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**5**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**53**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**3**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**4.80**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**4.99**	----	----	----	----
ø Ionic Balance	----	0.01	%		**1.98**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**55**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.03**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW113_210623	----	----	----	----
				Sampling date / time	23-Jun-2021 08:42	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107191-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.10**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.36**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.25**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.16**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.07**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.02**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0083_SW113_210623	----	----	----	----
				Sampling date / time	23-Jun-2021 08:42	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107191-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**0.84**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**0.15**	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**1.98**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.13**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**1.96**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**76.9**	----	----	----	----
13C8-PFOA	----	0.02	%		**83.8**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107191**	Page	: 1 of 9
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 29-Jun-2021
C-O-C number	: 24509	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3772349)									
EP2107185-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.86	7.93	0.9	0% - 20%
EP2107185-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.91	7.91	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3762502)									
EP2107191-001	0083_SW113_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	379	374	1.5	0% - 20%
EP2107092-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	5300	5120	3.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3762503)									
EP2107092-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	565	517	8.9	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3772348)									
EP2107185-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	116	1.9	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	116	1.9	0% - 20%
EP2107185-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	120	119	1.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	120	119	1.3	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3766621)									
EP2107191-001	0083_SW113_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	56	56	0.0	0% - 20%
EP2107437-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	150	149	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3766622)									
EP2107191-001	0083_SW113_210623	ED045G: Chloride	16887-00-6	1	mg/L	72	73	0.0	0% - 20%
EP2107437-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	129	131	1.5	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762880)									
EP2107188-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	341	326	4.4	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 3762880) - continued									
EP2107188-001	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	730	703	3.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5580	5420	3.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	304	296	2.5	0% - 20%
EP2107270-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	441	445	0.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1340	1360	1.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10300	10400	1.1	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	534	545	2.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3776981)									
EP2107189-008	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107270-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	37.6	43.8	15.2	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	0.10	29.2	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	2.40	2.67	10.6	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	1.16	1.30	10.7	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.18	0.22	18.6	0% - 50%
ES2124445-011	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	12.1	12.3	1.5	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.03	0.04	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.07	1.02	5.2	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.38	0.41	7.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.04	0.04	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	2.61	2.83	8.2	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.38	0.40	5.0	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.82	1.91	4.9	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	1.24	1.27	2.0	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	1.96	2.16	9.8	0% - 20%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	1.54	1.79	14.9	0% - 20%
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.69	0.76	10.3	0% - 20%
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.24	0.26	7.7	0% - 50%
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	0.08	0.09	17.8	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.2	0.2	0.0	No Limit
ES2124445-011	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.83	0.88	6.0	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.15	0.17	7.9	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.66	0.70	5.4	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.41	0.47	12.0	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.25	0.29	14.0	0% - 50%

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775610) - continued									
ES2124445-011	Anonymous	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	0.10	0.12	17.1	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.51	0.60	15.6	0% - 20%
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
ES2124445-011	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.12	0.13	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.20	0.22	12.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	1.54	1.80	15.2	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775610) - continued									
ES2124445-009	Anonymous	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
ES2124445-011	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.06	0.07	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	0.29	0.29	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	54.5	62.4	13.6	0% - 20%
ES2124445-011	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	16.6	17.0	2.6	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3772349)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3762502)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	104	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3762503)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	104	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3772348)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	97.8	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3766621)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	87.7	113
				<1	500 mg/L	99.0	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3766622)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	108	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3762880)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.8	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.6	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.4	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.3	73.2	116
				<1	100 mg/L	99.6	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775610)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	79.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	105	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	83.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	91.8	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775610) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	89.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	98.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	84.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	91.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	91.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	104	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	109	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	106	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	105	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	91.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	104	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	91.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	90.7	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	111	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	118	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	108	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775610)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	89.4	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	99.0	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	99.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	91.8	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3766621)							
EP2107191-001	0083_SW113_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	89.3	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3766622)							
EP2107191-001	0083_SW113_210623	ED045G: Chloride	16887-00-6	1000 mg/L	105	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)							
EP2107189-009	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	89.9	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	86.7	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	112	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	106	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	83.2	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	117	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	106	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	# Not Determined	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	121	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	117	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	105	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	108	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	96.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	87.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	119	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	109	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	84.5	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	95.0	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	97.0	57.6	145

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610) - continued							
ES2124445-007	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.6	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	100	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	86.4	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	120	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	132	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	84.4	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107191**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 1
Order number	: DEF19009/0083	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	**Perfluorohexane sulfonic acid (PFHxS)**	355-46-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	ES2124445--007	Anonymous	**Perfluorohexanoic acid (PFHxA)**	307-24-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	ES2124445--007	Anonymous	**Perfluorooctanoic acid (PFOA)**	335-67-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0083_SW113_210623	----	----	----	03-Jul-2021	23-Jun-2021	**10**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**03-Jul-2021**	23-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**29-Jun-2021**	30-Jun-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**29-Jun-2021**	30-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**03-Jul-2021**	07-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**07-Jul-2021**	21-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**07-Jul-2021**	21-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**30-Jun-2021**	30-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0083_SW113_210623	**23-Jun-2021**	**----**	----	----	**06-Jul-2021**	21-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_SW113_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0083_SW113_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0083_SW113_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0083_SW113_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0083_SW113_210623	**23-Jun-2021**	**06-Jul-2021**	20-Dec-2021	✓	**06-Jul-2021**	20-Dec-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	9	**22.22**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	**10.53**	**10.53**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	**5.26**	**5.26**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

CHAIN OF CUSTODY

COC#: **24513** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? (Yes) No N/A

Free ice / frozen ice bricks present upon receipt? (Yes) No N/A

Random Sample Temperature on Receipt: 15.9 °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0083_SD113		23/06/2021 08:46 AM	Soil	ALS: 2 Non ALS: 0	No	X		

CHAIN OF CUSTODY

COC#: **24513** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHA SED

ORDER NO: DEF19009/0083

PROJECT MANAGER: Maelle Bourdais CONTACT PH: SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais QUOTE NO: SY/139/19 / ES2019CARBSD0002

EMAIL REPORTS TO: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0083_SD113	Soil Glass Jar - Unpreserved	150 mL	00260321005785	Orange	No	
001	0083_SD113	HDPE Soil Jar	200 mL	00620719063136	Grey	No	

Total Bottle Count: ALS: 2, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107192**

Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0082_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0083	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24513	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHA		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 28-Jun-2021 13:25	Issue Date	: 28-Jun-2021
Client Requested Due Date	: 05-Jul-2021	Scheduled Reporting Date	: **05-Jul-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not intact.
No. of coolers/boxes	: 5	Temperature	: 15.9 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2107192-001	23-Jun-2021 08:46	0083_SD113_210623	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

CLAIRE ARMSTRONG		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	derp.labreports@esdat.com.au
Laura Beames		
- A4 - AU Tax Invoice (INV)	Email	laura.beames@cardno.com.au
MAELLE BOURDAIS		
- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107192**	Page	: 1 of 6
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021 13:25
Order number	: DEF19009/0083	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24513	Issue Date	: 05-Jul-2021 17:56
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0083_SD113_210623	----	----	----	----
			Sampling date / time	23-Jun-2021 08:46	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107192-001	--------	--------	--------	--------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.2**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**93**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**12.6**	----	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**19.0**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**1.8**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.1**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.2**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**21.1**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**0.8**	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**10.8**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**0.0013**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	**0.0005**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0002**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0083_SD113_210623	----	----	----	----
				Sampling date / time	23-Jun-2021 08:46	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107192-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		**0.0022**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		**0.0044**	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0086**	----	----	----	----

Analytical Results

Sub-Matrix: **SEDIMENT** (Matrix: **SOIL**)				Sample ID	0083_SD113_210623	----	----	----	----
				Sampling date / time	23-Jun-2021 08:46	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EP2107192-001**	--------	--------	--------	--------
					Result	----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0013**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0086**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**81.0**	----	----	----	----
13C8-PFOA	----	0.0002	%		**84.0**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107192**	Page	: 1 of 7
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0083	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24513	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHA		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3764010)									
EP2107093-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EP2107194-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3764009)									
EP2107093-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	1800	1800	0.4	0% - 20%
EP2107194-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	78	78	0.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3767754)									
EP2107192-001	0083_SD113_210623	EA055: Moisture Content	----	0.1	%	12.6	13.9	10.0	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3770959)									
EP2107026-006	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	0.6	0.8	31.5	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	6.9	7.5	8.6	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.4	0.5	0.0	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	7.8	8.5	8.9	0% - 20%
EP004: Organic Matter (QC Lot: 3767757)									
EP2107192-001	0083_SD113_210623	EP004: Organic Matter	----	0.5	%	10.8	11.0	1.1	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768558)									
EP2107026-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.0003	47.5	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2107034-004	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768558) - continued									
EP2107034-004	Anonymous	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3768558)									
EP2107026-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2107034-004	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3768558)									
EP2107026-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3768558) - continued									
EP2107026-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107034-004	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3768558)									
EP2107026-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107034-004	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3764010)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3764009)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	98.5	93.6	106
ED007: Exchangeable Cations (QCLot: 3770959)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	90.0	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	92.2	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	107	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	104	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	91.1	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
EP004: Organic Matter (QCLot: 3767757)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	118	70.0	120
				<0.5	85 %	91.7	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768558)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.0	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.2	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.4	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768558)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	81.9	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.6	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.4	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.5	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768558)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768558) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	99.8	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.0	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	87.0	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.9	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768558)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	89.6	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	80.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	114	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	107	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768558)							
EP2107026-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	77.6	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	89.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	85.6	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	78.0	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	78.4	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	114	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768558)							
EP2107026-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	83.8	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	86.0	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	85.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	90.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	80.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	90.4	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	84.8	69.0	133

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768558) - continued							
EP2107026-001	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	86.8	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	88.0	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	78.0	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	95.4	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768558)							
EP2107026-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	99.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	100	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	98.1	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	96.2	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	94.4	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	82.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	92.0	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768558)							
EP2107026-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	88.8	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	83.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	104	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	95.2	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107192**	Page	: 1 of 5
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/HEHA	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 1
Order number	: DEF19009/0083	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
0083_SD113_210623	01-Jul-2021	30-Jun-2021	**1**	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
0083_SD113_210623	01-Jul-2021	30-Jun-2021	**1**	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
0083_SD113_210623	**23-Jun-2021**	**01-Jul-2021**	30-Jun-2021	×	**01-Jul-2021**	01-Jul-2021	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
0083_SD113_210623	**23-Jun-2021**	**01-Jul-2021**	30-Jun-2021	×	**01-Jul-2021**	29-Jul-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
0083_SD113_210623	**23-Jun-2021**	**----**	----	----	**01-Jul-2021**	07-Jul-2021	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
0083_SD113_210623	**23-Jun-2021**	**02-Jul-2021**	21-Jul-2021	✓	**02-Jul-2021**	21-Jul-2021	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0083_SD113_210623	**23-Jun-2021**	**05-Jul-2021**	21-Jul-2021	✓	**05-Jul-2021**	21-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD113_210623	**23-Jun-2021**	**02-Jul-2021**	20-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0083_SD113_210623	**23-Jun-2021**	**02-Jul-2021**	20-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0083_SD113_210623	**23-Jun-2021**	**02-Jul-2021**	20-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0083_SD113_210623	**23-Jun-2021**	**02-Jul-2021**	20-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0083_SD113_210623	**23-Jun-2021**	**02-Jul-2021**	20-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	6	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	1	**200.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	6	**16.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing

☐ Sydney Laboratory — Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2066

☐ Brisbane Laboratory — Unit 1 21 Smallwood Place Murarrie QLD 4172

☐ Perth Laboratory

☐ Melbourne Laboratory

Company	CARDNO	Project №	WA_0082_PFASOMP	Project Manager	David James
Address	11 harvest Tce WEST PERTH	Project Name	HEH-A	EDD Format (ESdat, EQuIS etc)	ESdat
Contact Name	Maelle Bourdais				
Phone №	0448 308 372				
Special Directions	Please send ESdat report to derp.labreports@esdat.com.au with the project No in the header file.				
Purchase Order	DEF19009/530				
Quote ID №					

Sampler(s)	AH, SC, MB
Handed over by	~~AHS~~
Email for Invoice	~~claire.armstrong~~@cardno.com.au Paul2.beames
Email for Results	maelle.bourdais@cardno.com.au derp.labreports@esdat.com.au

Analyses — When crosses are required, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing

№	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)	Full PFAS suite	(water) Major anions & cations	(water) TSS, TDS, pH	(sediment) TOC, CEC, pH
1	0083_QC201_210622	22-6-21	S	X			X
2	0083_QC202_210622	22-6-21	W	X	X	X	
3	0083_QC203_210622	22-6-21	W	X	X	X	
4	0083_QC204_210622	22-6-21	W	X	X	X	
5	0083_QC205_210622	22-6-21	W	X	X	X	
6	0083_QC206_210622	22-6-21	W	X	X	X	
7	0083_QC207_210622	22-6-21	W	X	X	X	
8							
9							
10							
	Total Counts						

Containers — Change container type & size if necessary

500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA vial	500mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4964, WA Guidelines)

Required Turnaround Time (TAT) — Default will be 5 days if not ticked

♦Surcharge will apply

- ☐ Overnight (reporting by 9am)♦
- ☐ Same day♦ ☐ 1 day♦
- ☐ 2 days♦ ☐ 3 days♦
- ☒ 5 days (Standard)
- ☐ Other(

Sample Comments / Dangerous Goods Hazard Warning

Date/Time: 24/6/21 10:50

Chilled: Yes No

Initial Temp: 8.1 8.7 10.6 8.9°C

Final Temp:

Method of Shipment: ☒ Courier (# ☐ Hand Delivered ☐ Postal — Name — Signature — Date — Time

Laboratory Use Only								
Received By	Rob Johnston	SYD | BNE | MEL | (PER) | ADL | NTL | DRW	Signature		Date	24/6/21	Time	10:00
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date		Time	

Temperature 8.9°C

Report № 805492

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ABN: 50 005 085 521 www.eurofins.com.au EnviroSales@eurofins.com

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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name:	Cardno (WA)
Contact name:	Maelle Bourdais
Project name:	HEH-A
Project ID:	WA_0082_PFASOMP
Turnaround time:	5 Day
Date/Time received	Jun 24, 2021 10:00 AM
Eurofins reference	805492

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Rhys Thomas on phone : (+61) 8 9251 9602 or by email: RhysThomas@eurofins.com

Results will be delivered electronically via email to Maelle Bourdais - Maelle.Bourdais@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (WA) email address.

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IANZ # 1290

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/630
Report #: 805492
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 24, 2021 10:00 AM
Due: Jul 1, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794													X		
Perth Laboratory - NATA Site # 23736															
Mayfield Laboratory - NATA Site # 25079															
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	0083_QC201_210622	Jun 22, 2021		Soil	P21-Jn48729	X		X		X	X		X		
2	0083_QC202_210622	Jun 22, 2021		Water	P21-Jn48730		X		X			X	X	X	X
3	0083_QC203_210622	Jun 22, 2021		Water	P21-Jn48731		X		X			X	X	X	X
4	0083_QC204_210622	Jun 22, 2021		Water	P21-Jn48732		X		X			X	X	X	X
5	0083_QC205_210622	Jun 22, 2021		Water	P21-Jn48733		X		X			X	X	X	X
6	0083_QC206_	Jun 22, 2021		Water	P21-Jn48734		X		X			X	X	X	X

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/630
Report #: 805492
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 24, 2021 10:00 AM
Due: Jul 1, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794													X		
Perth Laboratory - NATA Site # 23736															
Mayfield Laboratory - NATA Site # 25079															
External Laboratory															
	210622														
7	0083_QC207_210622	Jun 22, 2021		Water	P21-Jn48735		X		X			X	X	X	X
Test Counts						1	6	1	6	1	1	6	7	6	6

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005

NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Maelle Bourdais**

Report **805492-S**
Project name HEH-A
Project ID WA_0082_PFASOMP
Received Date Jun 24, 2021

Client Sample ID			**0083_QC201_210622**
Sample Matrix			**Soil**
Eurofins Sample No.			**P21-Jn48729**
Date Sampled			**Jun 22, 2021**
Test/Reference	LOR	Unit	
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	1300
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.7
Total Organic Carbon	0.1	%	< 0.1
% Moisture	1	%	19
Cation Exchange Capacity			
Cation Exchange Capacity	0.05	meq/100g	31
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	58
13C5-PFPeA (surr.)	1	%	71
13C5-PFHxA (surr.)	1	%	73
13C4-PFHpA (surr.)	1	%	72
13C8-PFOA (surr.)	1	%	75
13C5-PFNA (surr.)	1	%	80
13C6-PFDA (surr.)	1	%	91
13C2-PFUnDA (surr.)	1	%	116
13C2-PFDoDA (surr.)	1	%	121
13C2-PFTeDA (surr.)	1	%	98
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5

Client Sample ID			0083_QC201_210622
Sample Matrix			**Soil**
Eurofins Sample No.			**P21-Jn48729**
Date Sampled			**Jun 22, 2021**
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	81
D3-N-MeFOSA (surr.)	1	%	85
D5-N-EtFOSA (surr.)	1	%	84
D7-N-MeFOSE (surr.)	1	%	100
D9-N-EtFOSE (surr.)	1	%	99
D5-N-EtFOSAA (surr.)	1	%	89
D3-N-MeFOSAA (surr.)	1	%	107
Perfluoroalkyl sulfonic acids (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	82
18O2-PFHxS (surr.)	1	%	82
13C8-PFOS (surr.)	1	%	87
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5
13C2-4:2 FTS (surr.)	1	%	45
13C2-6:2 FTSA (surr.)	1	%	46
13C2-8:2 FTSA (surr.)	1	%	79
13C2-10:2 FTSA (surr.)	1	%	89
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Conductivity (1:5 aqueous extract at 25°C as rec.)	Melbourne	Jun 26, 2021	7 Days
- Method: LTM-INO-4030 Conductivity			
Cation Exchange Capacity	Melbourne	Jun 28, 2021	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage			
pH (1:5 Aqueous extract at 25°C as rec.)	Melbourne	Jun 26, 2021	7 Days
- Method: LTM-GEN-7090 pH in soil by ISE			
Total Organic Carbon	Melbourne	Jun 28, 2021	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
% Moisture	Melbourne	Jun 24, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jun 25, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jun 25, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jun 25, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jun 25, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794													X		
Perth Laboratory - NATA Site # 23736															
Mayfield Laboratory - NATA Site # 25079															
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	0083_QC201_210622	Jun 22, 2021		Soil	P21-Jn48729	X		X		X	X		X		
2	0083_QC202_210622	Jun 22, 2021		Water	P21-Jn48730		X		X			X	X	X	X
3	0083_QC203_210622	Jun 22, 2021		Water	P21-Jn48731		X		X			X	X	X	X
4	0083_QC204_210622	Jun 22, 2021		Water	P21-Jn48732		X		X			X	X	X	X
5	0083_QC205_210622	Jun 22, 2021		Water	P21-Jn48733		X		X			X	X	X	X
6	0083_QC206_	Jun 22, 2021		Water	P21-Jn48734		X		X			X	X	X	X

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Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794													X		
Perth Laboratory - NATA Site # 23736															
Mayfield Laboratory - NATA Site # 25079															
External Laboratory															
	210622														
7	0083_QC207_210622	Jun 22, 2021		Water	P21-Jn48735		X		X			X	X	X	X
Test Counts						1	6	1	6	1	1	6	7	6	6

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Conductivity (1:5 aqueous extract at 25°C as rec.)	uS/cm	< 10			10	Pass	
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Total Organic Carbon	%	97			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	89			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	79			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	88			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	90			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	86			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	93			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorodecanoic acid (PFDA)	%	91			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	95			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	91			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	72			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	91			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	89			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	82			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	92			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	85			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	93			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	78			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	90			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	87			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	93			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	87			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	84			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	83			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	75			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	96			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	91			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	93			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	98			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	87			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	P21-Jn48729	CP	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48729	CP	%	76			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48729	CP	%	88			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48729	CP	%	81			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48729	CP	%	88			50-150	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48729	CP	%	90			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48729	CP	%	88			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48729	CP	%	87			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48729	CP	%	84			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48729	CP	%	75			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48729	CP	%	97			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	P21-Jn48729	CP	%	88			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48729	CP	%	88			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48729	CP	%	84			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48729	CP	%	88			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48729	CP	%	94			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48729	CP	%	84			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48729	CP	%	84			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48729	CP	%	82			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48729	CP	%	86			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48729	CP	%	83			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48729	CP	%	80			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48729	CP	%	85			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48729	CP	%	79			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48729	CP	%	86			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48729	CP	%	78			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P21-Jn48729	CP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48729	CP	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48729	CP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48729	CP	%	83			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	M21-Jn49011	NCP	%	9.7	10	5.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48658	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48658	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48658	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48658	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Cardno Consulting WA
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WA 6005

NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Maelle Bourdais**

Report **805492-W**
Project name HEH-A
Project ID WA_0082_PFASOMP
Received Date Jun 24, 2021

Client Sample ID			**0083_QC202_210622**	**0083_QC203_210622**	**0083_QC204_210622**	**0083_QC205_210622**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**P21-Jn48730**	**P21-Jn48731**	**P21-Jn48732**	**P21-Jn48733**
Date Sampled			**Jun 22, 2021**	**Jun 22, 2021**	**Jun 22, 2021**	**Jun 22, 2021**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	3700	20000	8200	10000
pH (at 25 °C)	0.1	pH Units	7.9	8.2	8.3	8.2
Sulphate (as SO4)	5	mg/L	1900	3000	1000	1300
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	9300	24000	14000	11000
Total Suspended Solids Dried at 103–105°C	1	mg/L	6.2	11	17	3.8
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	70	140	420	220
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	< 10	< 10	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	< 20	< 20
Total Alkalinity (as CaCO3)	20	mg/L	70	140	420	220
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	0.5	mg/L	570	540	280	300
Magnesium	0.5	mg/L	310	1500	540	770
Potassium	0.5	mg/L	92	500	170	250
Sodium	0.5	mg/L	2200	10000	4600	6600
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	< 0.01	< 0.01	0.03	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	< 0.01	< 0.01	0.02	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	81	83	75	81
13C5-PFPeA (surr.)	1	%	114	107	111	108
13C5-PFHxA (surr.)	1	%	127	109	133	116
13C4-PFHpA (surr.)	1	%	116	97	127	99
13C8-PFOA (surr.)	1	%	111	104	125	107
13C5-PFNA (surr.)	1	%	97	94	109	96
13C6-PFDA (surr.)	1	%	81	76	87	80
13C2-PFUnDA (surr.)	1	%	69	63	75	77

Client Sample ID			0083_QC202_210622	0083_QC203_210622	0083_QC204_210622	0083_QC205_210622
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn48730	P21-Jn48731	P21-Jn48732	P21-Jn48733
Date Sampled			Jun 22, 2021	Jun 22, 2021	Jun 22, 2021	Jun 22, 2021
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C2-PFDoDA (surr.)	1	%	40	39	46	48
13C2-PFTeDA (surr.)	1	%	INT	INT	INT	12
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	83	78	89	78
D3-N-MeFOSA (surr.)	1	%	77	59	83	60
D5-N-EtFOSA (surr.)	1	%	73	51	74	60
D7-N-MeFOSE (surr.)	1	%	33	24	33	28
D9-N-EtFOSE (surr.)	1	%	29	21	30	23
D5-N-EtFOSAA (surr.)	1	%	27	60	40	48
D3-N-MeFOSAA (surr.)	1	%	30	64	44	54
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	< 0.01	[N09]0.03	[N09]0.02
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01	< 0.01	[N09]0.61	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	107	106	111	108
18O2-PFHxS (surr.)	1	%	98	95	95	96
13C8-PFOS (surr.)	1	%	85	83	82	88
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	< 0.05	0.07	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	85	36	59	65
13C2-6:2 FTSA (surr.)	1	%	87	34	65	74
13C2-8:2 FTSA (surr.)	1	%	81	62	79	87
13C2-10:2 FTSA (surr.)	1	%	37	32	37	41

Client Sample ID			0083_QC202_210622	0083_QC203_210622	0083_QC204_210622	0083_QC205_210622
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn48730	P21-Jn48731	P21-Jn48732	P21-Jn48733
Date Sampled			Jun 22, 2021	Jun 22, 2021	Jun 22, 2021	Jun 22, 2021
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	< 0.01	0.64	0.02
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01	0.61	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01	0.64	0.02
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	< 0.05	0.76	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	< 0.1	0.76	< 0.1

Client Sample ID			0083_QC206_210622	0083_QC207_210622
Sample Matrix			Water	Water
Eurofins Sample No.			P21-Jn48734	P21-Jn48735
Date Sampled			Jun 22, 2021	Jun 22, 2021
Test/Reference	LOR	Unit		
Chloride	1	mg/L	8600	5000
pH (at 25 °C)	0.1	pH Units	8.3	8.3
Sulphate (as SO4)	5	mg/L	1400	990
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	16000	9200
Total Suspended Solids Dried at 103–105°C	1	mg/L	7.4	13
Alkalinity (speciated)				
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	600	870
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20	< 20
Total Alkalinity (as CaCO3)	20	mg/L	600	870
Eurofins Suite B11C: Na/K/Ca/Mg				
Calcium	0.5	mg/L	280	230
Magnesium	0.5	mg/L	550	400
Potassium	0.5	mg/L	200	140
Sodium	0.5	mg/L	4900	3300
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	0.50	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	1.3	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	[N09]1.1	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	0.23	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	[N09]0.03	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA)[N11]	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTrDA)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	58	84
13C5-PFPeA (surr.)	1	%	62	121
13C5-PFHxA (surr.)	1	%	95	133
13C4-PFHpA (surr.)	1	%	136	114
13C8-PFOA (surr.)	1	%	149	112
13C5-PFNA (surr.)	1	%	142	99
13C6-PFDA (surr.)	1	%	123	83
13C2-PFUnDA (surr.)	1	%	100	69

Client Sample ID			0083_QC206_210622	0083_QC207_210622
Sample Matrix			Water	Water
Eurofins Sample No.			P21-Jn48734	P21-Jn48735
Date Sampled			Jun 22, 2021	Jun 22, 2021
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
13C2-PFDoDA (surr.)	1	%	60	43
13C2-PFTeDA (surr.)	1	%	11	INT
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	95	83
D3-N-MeFOSA (surr.)	1	%	82	71
D5-N-EtFOSA (surr.)	1	%	73	64
D7-N-MeFOSE (surr.)	1	%	37	30
D9-N-EtFOSE (surr.)	1	%	32	24
D5-N-EtFOSAA (surr.)	1	%	47	27
D3-N-MeFOSAA (surr.)	1	%	53	30
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	0.09	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	0.02	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	[N09]0.08	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]0.51	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.08	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	98	108
18O2-PFHxS (surr.)	1	%	90	94
13C8-PFOS (surr.)	1	%	92	87
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	0.10	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	69	76
13C2-6:2 FTSA (surr.)	1	%	87	77
13C2-8:2 FTSA (surr.)	1	%	95	81
13C2-10:2 FTSA (surr.)	1	%	41	39

Client Sample ID			0083_QC206_210622	0083_QC207_210622
Sample Matrix			**Water**	**Water**
Eurofins Sample No.			**P21-Jn48734**	**P21-Jn48735**
Date Sampled			**Jun 22, 2021**	**Jun 22, 2021**
Test/Reference	LOR	Unit		
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	0.59	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.11	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.62	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	3.94	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	4.04	< 0.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO4/Alkalinity			
Chloride	Melbourne	Jun 25, 2021	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO4)	Melbourne	Jun 25, 2021	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Jun 25, 2021	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
pH (at 25 °C)	Melbourne	Jun 25, 2021	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Jun 25, 2021	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Jun 25, 2021	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Jun 25, 2021	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jun 28, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jun 28, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Brisbane	Jun 28, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jun 28, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins | Environment Testing

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Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/630
Report #: 805492
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 24, 2021 10:00 AM
Due: Jul 1, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794													X		
Perth Laboratory - NATA Site # 23736															
Mayfield Laboratory - NATA Site # 25079															
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	0083_QC201_210622	Jun 22, 2021		Soil	P21-Jn48729	X		X		X	X		X		
2	0083_QC202_210622	Jun 22, 2021		Water	P21-Jn48730		X		X			X	X	X	X
3	0083_QC203_210622	Jun 22, 2021		Water	P21-Jn48731		X		X			X	X	X	X
4	0083_QC204_210622	Jun 22, 2021		Water	P21-Jn48732		X		X			X	X	X	X
5	0083_QC205_210622	Jun 22, 2021		Water	P21-Jn48733		X		X			X	X	X	X
6	0083_QC206_	Jun 22, 2021		Water	P21-Jn48734		X		X			X	X	X	X

eurofins | Environment Testing

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Company Name: Cardno (WA)
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Project Name: HEH-A
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/630
Report #: 805492
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 24, 2021 10:00 AM
Due: Jul 1, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217															
Brisbane Laboratory - NATA Site # 20794													X		
Perth Laboratory - NATA Site # 23736															
Mayfield Laboratory - NATA Site # 25079															
External Laboratory															
	210622														
7	0083_QC207_210622	Jun 22, 2021		Water	P21-Jn48735		X		X			X	X	X	X
Test Counts						1	6	1	6	1	1	6	7	6	6

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO4)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	99			70-130	Pass	
Sulphate (as SO4)	%	99			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	93			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	97			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	96			70-130	Pass	
Total Alkalinity (as CaCO3)	%	102			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	99			80-120	Pass	
Magnesium	%	92			80-120	Pass	
Potassium	%	97			80-120	Pass	
Sodium	%	103			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	117			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	108			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	111			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	113			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	113			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	117			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	110			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	109			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	115			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	73			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	116			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	111			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	113			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	110			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	119			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	115			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	110			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	101			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	98			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	89			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	102			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	102			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	105			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	119			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	103			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	69			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	105			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	122			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	93			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	115			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
				Result 1					
Sulphate (as SO4)	M21-Jn49043	NCP	%	94			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	K21-Jn41606	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	P21-Jn48731	CP	%	105			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48731	CP	%	106			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48731	CP	%	111			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48731	CP	%	108			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48731	CP	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48731	CP	%	115			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48731	CP	%	120			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48731	CP	%	112			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48731	CP	%	111			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48731	CP	%	75			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48731	CP	%	122			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	P21-Jn48731	CP	%	112			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48731	CP	%	121			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48731	CP	%	114			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48731	CP	%	120			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48731	CP	%	123			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48731	CP	%	116			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48731	CP	%	120			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48731	CP	%	100			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48731	CP	%	97			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48731	CP	%	106			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48731	CP	%	111			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48731	CP	%	106			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48731	CP	%	116			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48731	CP	%	105			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48731	CP	%	68			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P21-Jn48731	CP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48731	CP	%	127			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48731	CP	%	87			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48731	CP	%	115			50-150	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	P21-Jn48734	CP	%	108			75-125	Pass	
Magnesium	P21-Jn48734	CP	%	101			75-125	Pass	
Potassium	P21-Jn48734	CP	%	95			75-125	Pass	
Sodium	P21-Jn48734	CP	%	100			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
				Result 1	Result 2	RPD			
Chloride	P21-Jn48935	NCP	mg/L	180	160	10	30%	Pass	
pH (at 25 °C)	B21-Jn46847	NCP	pH Units	8.1	8.1	pass	30%	Pass	
Sulphate (as SO4)	P21-Jn48935	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	M21-Jn58890	NCP	mg/L	170	220	23	30%	Pass	
Total Suspended Solids Dried at 103–105°C	K21-Jn41616	NCP	mg/L	360	360	<1	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	B21-Jn46847	NCP	mg/L	160	170	5.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	B21-Jn46847	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	B21-Jn46847	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	B21-Jn46847	NCP	mg/L	160	170	5.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48730	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48730	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	P21-Jn48734	CP	mg/L	280	320	12	30%	Pass	
Magnesium	P21-Jn48734	CP	mg/L	550	600	9.0	30%	Pass	
Potassium	P21-Jn48734	CP	mg/L	200	210	6.0	30%	Pass	
Sodium	P21-Jn48734	CP	mg/L	4900	5200	6.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Table D1 - Groundwater Field Records

Monitoring Date	Monitoring Location	Sample_ID	Bore Type	TOC (mAHD)	Well Depth (m)	Screen Interval (bgl)	Gauging Time	SWL (mbTOC)	RWL (mAHD)	Other Observations on Bore/Site	Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	QC Dup Sample #	Odour Comments	Colour
22/06/2021	MW003	0083_MW003_210622	Single Level	3.263	5	2 - 5_	12:41	2.795	0.468		HydraSleeve	25.6	2.05	30232	19652.2	7.6	-14.8	QC104, QC204	Hydrocarbon	Clear
22/06/2021	MW008	0083_MW008_210622	Single Level	2.846	5.5	2.5 - 5.5_	12:23	2.305	0.541		HydraSleeve	26.1	1.11	31499	20475	7.62	-69.8		Slight hydrocarbon	Clear
22/06/2021	MW017	0083_MW017_210622	Single Level	3.421	6	3 - 6_	15:53	3.12	0.301		HydraSleeve	27.3	1.82	16215	10543	7.48	7.8			Clear
23/06/2021	MW019	0083_MW019_210623	Single Level	2.955	4.5	1.5 - 4.5_	08:21	2.61	0.345		HydraSleeve	25.3	1.89	21372	13884	7.27	-57.2			Cloudy
23/06/2021	MW027	0083_MW027_210623	Single Level	4.499	6	3 - 6_	08:13	4.18	0.319	Dead ants in sleeve.	HydraSleeve	24	0.83	26933	17576	6.62	-228.8			Clear
23/06/2021	MW101	0083_MW101_210623	Single Level	2.4356	4.5	2 - 4.5_	09:08	2.1	0.336	Not enough water for DOC sample	HydraSleeve	24.6	0.98	12612	8196.5	7.38	-263.4		Sulfur	Cloudy,Black
22/06/2021	MW102	0083_MW102_210622	Single Level	2.6924	5.8	1 - 6_	16:04	2.4	0.292		HydraSleeve	26.5	1.99	7129	4634.5	7.84	74.5			Clear,Cloudy
22/06/2021	MW103	0083_MW103_210622	Single Level	2.7898	5.43	1 - 6_	15:13	2.55	0.24		HydraSleeve	25.6	1.44	15212	9886.5	7.48	70.7	QC106, QC206		Clear,Brown
22/06/2021	MW104	0083_MW104_5.5-6_210622	Multi level	3.9903	6	5.5 - 6_	16:00	3.65	0.34		Peristaltic Pump	22.8	2.37	18136	11791	7.74	46.7	Qc107		Cloudy
22/06/2021	MW105	0083_MW105_210622	Multi level	3.1082	4.93	4 - 4.5	13:22	2.62	0.488		Peristaltic Pump	27.5	2.54	15597	10140	7.53	-68			Clear,Cloudy
22/06/2021	MW107	0083_MW107_3.1-4.1_210622	Multi level	4.7144	4.1	3.1 - 4.1_	09:14	2.4	2.314		Peristaltic Pump	20.3	4.06	52872	34385	7.56	14.7			Cloudy
22/06/2021	MW109	0083_MW109_9.3-9.8_210622	Multi level	7.0413	9.8	9.3 - 9.8_	14:55	6.473	0.568		Peristaltic Pump	23	3.69	53084	34515	7.57	74.8			Clear
22/06/2021	MW110	0083_MW110_9-9.5_210622	Multi level	8.2807	9.5	9 - 9.5_	14:54	7.78	0.501		Peristaltic Pump	22.3	3.01	31422	20423	7.67	-28.4			Clear
22/06/2021	MW111	0083_MW111_10.5-11_210622	Multi level	8.8279	11	10.5 - 11_	10:28	8.374	0.454		Peristaltic Pump	21.3	0.55	53150	34554	7.78	-313.6			Cloudy
22/06/2021	MW112	0083_MW112_4.5-5_210622	Multi level	3.0636	5	4.5 - 5_	17:03				Peristaltic Pump	20.6	4.43	53824	34989.5	7.68	89.4			
22/06/2021	MW113	0083_MW113_2.5-3.5_210622	Multi level	2.97	3.5	2.5 - 3.5_	14:33	2.475	0.495		Peristaltic Pump	25.7	4.27	29895	19422	7.67	135.3			Cloudy
22/06/2021	MW114	0083_MW114_2-3_210622	Multi level	2.9356	3	2 - 3_	14:24	2.5	0.436		Peristaltic Pump	27.2	5.38	30347	19727	7.81	133.5			Cloudy
22/06/2021	MW115	0083_MW115_8.5-9_210622	Multi level	2.6909	9	8.5 - 9_	11:02	2.36	0.331		Peristaltic Pump	23.8	4.73	42122	27371	7.88	130.5			Cloudy
22/06/2021	MW116	0083_MW116_4.5-5_210622	Multi level	2.3885	5	4.5 - 5_	13:59	2.36	0.029		Peristaltic Pump	24.6	4.37	36072	23543	7.86	146.9			Clear
22/06/2021	MW117	0083_MW117_6-6.5_210622	Multi level	2.7296	6.5	6 - 6.5_	10:16	2.32	0.41		Peristaltic Pump	24.1	3.22	38020	24771	7.72	139.9			Clear
23/06/2021	MW119	0083_MW119_210623	Single Level	3.5069	5.1	2.1 - 5.1_	08:53	3.12	0.387		HydraSleeve	25.2	1.53	27112	17634	7.63	-117.1			Clear
	MW123	Access denied to the antenna field due to Base activities. Not sampled																		
22/06/2021	MW129	0083_MW129_210622	Multi level	2.0256	2.38	1.5 - 2_	10:35	1.75	0.276		Peristaltic Pump	23.2	1.73	26907	17408	7.33	57.8			Cloudy,Black
22/06/2021	MW130	0083_MW130_210622	Multi level	2.016	2.51	1.4 - 1.9_	09:39	1.701	0.315	Missing cap on well	Peristaltic Pump	21.9	3.5	31585	20533	7.32	105.3			Cloudy
22/06/2021	MW134	0083_MW134_210622	Multi level	10.0786	12.5	6.5 - _12.5_	09:11	9.75	0.329		Peristaltic Pump	22.4	1.38	43477	28262	7.41	63.3			Clear
22/06/2021	MW202	0083_MW202_210622	Single Level	8.069	9.9	6.9 - 9.9_	11:40	7.586	0.483		HydraSleeve	24.4	4.8	27869	18109	7.72	116.6			Black
22/06/2021	MW210	0083_MW210_210622	Single Level	2.863	4.11	1.5 - 4_	13:40	2.325	0.538		HydraSleeve	26.9	0.78	27551	17907.5	7.44	20.7			Clear
22/06/2021	MW212	0083_MW212_210622	Single Level	3.513	4.8	1 - 4_	13:59	2.95	0.563		HydraSleeve	26.5	0.87	28374	18447	7.52	53.1	QC105, QC205		Clear
23/06/2021	MW213	0083_MW213_210623	Single Level	4.49	5.5	2.5 - 5.5_	08:50	4.19	0.3	Not enough water for DOC sample	HydraSleeve	23.6	2.1	5367	3490.5	7.35	-51.3			Clear
22/06/2021	MW214	0083_MW214_210622	Single Level	4.29	5.5	2.5 - 5.5_	15:32	3.74	0.55	Not enough water to fill all sampling bottles	HydraSleeve	25.2	3.9	5867	3809	8.25	103.1			Clear
22/06/2021	MW217	0083_MW217_210622	Single Level	3.658	4.5	1.2 - 4.5_	12:17	3.6	0.058		HydraSleeve	24.4	3.58	43182	28086.5	7.62	136.8			Clear
22/06/2021	MW218	0083_MW218_210622	Single Level	5.137	5.8	2.8 - 5.8_	12:06	4.81	0.327		HydraSleeve	25.6	4.39	10748	6987.5	7.86	119.4			Clear

Monitoring Location	Date	Sample ID	Sampling Method	Sample Depth (m)	Water Body Depth (m)	Flow Rate	Comments	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Water Colour	Turbidity
SW112	22/06/2021	0083_SW112_210622	Direct into Bottle	0.2	0.2	Slow		20.5	5.83	71983	46800	8.02	118	Clear	Low
SW113	23/06/2021	0083_SW113_210623	Direct into Bottle	0.1	0.7	None	Taken from retention at end of pipe	13.5	7.07	485.9	313	8.07	17.5	Yellow	Medium
SW120	22/06/2021	0083_SW120_210622	Direct into Bottle	0.2	0.15	Slow		18.5	6.71	26081	16952	8.21	95.2	Clear	Medium
SW126	22/06/2021						DRY								
SW127	22/06/2021	0083_SW127_210622	Direct into Bottle	0.05	0.1	Slow		15.9	7	21870	14215	8.05	129.4	Clear	Low
SW128	22/06/2021	0083_SW128_210622	Direct into Bottle	0.1	0.4	Slow	QC102/202. weather clear.	15	6.79	14142	9191	8.14	119.2	Clear	Low
OTH002	22/06/2021	0083_OTH002_210622	Direct into bottle	0.3			Qc103/203	21.4	4.63	54620	35490	7.87	47.2	Clear	Low
OTH101	22/06/2021	0083_OTH101_210622	Direct into bottle	0.3				21.6	5.05	29512	19246	8.1	-62.9	Clear	Low
OTH102	22/06/2021	0083_OTH102_210622	Direct into bottle	0.2				22.3	4.07	54611	35490	8.08	-163.5	Clear	Low
OTH103	22/06/2021	0083_OTH103_210622	Direct into bottle	0.3				19.4	5.37	54942	35711	7.97	60.7	Clear	Low
OTH104	22/06/2021	0083_OTH104_210622	Direct into bottle	0.8				21.6	4.85	55187	35880	8.05	117.1	Clear	Low
OTH105	22/06/2021	0083_OTH105_210622	Direct into bottle	0.4				22.1	4.72	55423	36010	8.05	127.2	Clear	Low
OTH106	22/06/2021	0083_OTH106_210622	Direct into bottle	0.4				19.3	5.78	28920	18798	8.09	133.1	Clear	Low
OTH107	22/06/2021	0083_OTH107_210622	Direct into bottle	0.3				18.4	6.13	55382	35990.5	8.05	132.6	Clear	Low
OTH108	22/06/2021	0083_OTH108_210622	Direct into bottle	0.4				17.4	6.04	36420	23699	7.99	136.3	Clear	Low
OTH109	22/06/2021	0083_OTH109_210622	Direct into bottle	0.3				24.1	4.22	51999	33800	7.99	116.7	Clear	Low
OTH110	22/06/2021	0083_OTH110_210622	Direct into bottle	0.6				22.9	4.58	54161	35230	8	88.5	Clear	Low
OTH113	22/06/2021	0083_OTH113_210622	Direct into bottle	0.3				20.8	3.99	54859	35685	8.1	94.9	Clear	Low

Location ID	Date	Sample ID	Sampling Depth (m)	Sampling Method	Sample Condition	Sample Description	Comments
SD112	22/06/2021	0083_SD112_210622	0.15	Direct_into_Bottle	Wet	Grey/brown sandy clay	
SD113	23/06/2021	0083_SD113_210623	0.1	Direct_into_Bottle	Dry	Brown silty sand with black organic material throughout	
SD120	22/06/2021	0083_SD120_210622	0.2	Direct_into_Bottle	Wet	Grey/black clay	
SD126	22/06/2021	0083_SD126_210622	0.1	Direct_into_Bottle	Dry	Red/brown clay	
SD127	22/06/2021	0083_SD127_210622	0.1	Direct_into_Bottle	Wet	brown clay	
SD128	22/06/2021	0083_SD128_210622	0.1	Direct_into_Bottle	Wet	Beige sand	QC101/201

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno
Contact: Maelle

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 21D101799
Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	174.10 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 58.77
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 11 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature	Check Temp NATA	Room Temp	18.3	0	°C	NA	18.3	°C
pH	pH 7.00	356684	7.01	-5.90	mV	7.1	7.01	pH
pH	pH 4.00	355385	4.00	168.20	mV	4.06	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.09	2770	2764	µs/cm
ORP (Reference check only)	Zobell A & B	21/0502	244	244	mV	225.8	232.9	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	-0.9	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	4.7	uA	93.2	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 12-Jun-21
Next Due: 09-Dec-21

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno
Contact: Maelle

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 20B120527
Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	171.20 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 58.01
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 5 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature	Check Temp NATA	Room Temp	16.6	-0.1	°C	NA	16.5	°C
pH	pH 7.00	356684	7.01	-36.00	mV	7.04	7.01	pH
pH	pH 4.00	355385	4.00	135.20	mV	4	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.06	2742	2764	µs/cm
ORP (Reference check only)	Zobell A & B	21/0502	248	248	mV	243.4	243.1	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	-0.1	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	4.09	uA	102	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 17-Jun-21
Next Due: 14-Dec-21

GK Environmental EQUIPMENT

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno
Contact: Maelle

Manufacturer: YSI
Instrument: Professional Plus with Quatro cable
Serial #: 19K102536
Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	173.10 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 58.56
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 4 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

						Instrument Readings		
Parameter	**Standards**	**Reference**	**Calibration Point**	**Span**	**Units**	**Before**	**After**	**Units**
Temperature	Check Temp NATA	Room Temp	17.8	-0.1	°C	NA	17.7	°C
pH	pH 7.00	356684	7.01	-27.90	mV	7	7.01	pH
pH	pH 4.00	355385	4.00	145.20	mV	3.97	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.06	2765	2764	µs/cm
ORP (Reference check only)	Zobell A & B	21/0502	245	245	mV	253	241.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	-0.2	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	4.49	uA	93.8	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 14-Jun-21
Next Due: 11-Dec-21

Date of Bump Test	Project ID	Unit Brand/ Model	Ambient Air Oxygen Calibration	Zero % Oxygen Solution Calibration	Standard Concentrations	Ambient Temperature (°C)	Bump Test Reading	Bump Test Readings within ±5%?	Comment	Test by (Name)	(Signature)
DNB 22/6	DEF	YSI # 20B	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm Y / N	18 20	pH 4.00: 4.30 pH 7.00: 7.17 Temp: 19.5 EC: 2768	pH 4.00: (± pH 0.2) Y / (N) pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) N EC: (± 150µS/cm) (Y) N		Ashley Harris	
DNB 2216	DEF	YSI # 19K	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm (Y) / N	18° 20	pH 4.00: 4.25 pH 7.00: 7.04 Temp: 19.2 EC: 2780.	pH 4.00: (± pH 0.2) Y / (N) pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) / N EC: (± 150µS/cm) (Y) / N ~~Y / N~~		11	
22/6	DEF	YSI # 21D	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm (Y) / N	18° 20	pH 4.00: 4.2 pH 7.00: 7.07 Temp: 19.5 EC: 2797	pH 4.00: (± pH 0.2) (N) N pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) / N EC: (± 150µS/cm) (Y) / N ~~Y / N~~		11	
23/6	DEF	YSI # 20B	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm (Y) / N	19	pH 4.00: 4.30 pH 7.00: 7.17 Temp: 18.8 EC: 2760	pH 4.00: (± pH 0.2) Y / (N) pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) / N EC: (± 150µS/cm) (Y) / N ~~Y / N~~		11	
23/6	DEF	YSI # 19K	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm (Y) / N	19	pH 4.00: 4.37 pH 7.00: 7.08. Temp: 18.8 EC: 2871	pH 4.00: (± pH 0.2) Y / (N) pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) / N EC: (± 150µS/cm) (Y) / N ~~Y / N~~		11	
23/6	DEF	YSI # 21D	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm (Y) / N	19	pH 4.00: 4.34 pH 7.00: 7.19 Temp: 18.8 EC: 2749	pH 4.00: (± pH 0.2) Y / (N) pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) / N EC: (± 150µS/cm) (Y) / N ~~Y / N~~		11	
	DEF	YSI # 19K	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm (Y) / N	21	pH 4.00: ~~4~~ 20.2 pH 7.00: 7.08 Temp: 20 EC: 2820	pH 4.00: (± pH 0.2) (Y) / N pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) / N EC: (± 150µS/cm) (Y) / N ~~Y / N~~		11	
	11	YSI # 20B	100% Saturation? (Y) N	0% Calibration? (Y) N NA	pH 4.00 (Y) / N pH 7.00 (Y) / N EC: 2,760µS/cm (Y) / N	21	pH 4.00: 4.19 pH 7.00: 7.16 Temp: 20.2 EC: 2860	pH 4.00: (± pH 0.2) (Y) / N pH 7.00: (± pH 0.2) (Y) / N Temp: (± 2°C) (Y) / N EC: (± 150µS/cm) (Y) / N ~~Y / N~~		11	
4	21D	Y	Y	Y ↓ 4	21	pH 4.05 Y pH 7: 7.1 Y Temp 20.2 Y EC: 2790 Y					

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review
PFAS OMP biannual monitoring event

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as field blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
	QA Documentation
Project Quality Plan/Work Plan and Data Quality Objectives	The field investigation was carried out between the 22 June 2021 and 23 June 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (ref DEF19009_Harold E Holt Area A_SAQP_Rev4) issued to the client and in general compliance with the Australian standards AS 4482.1- 2005 "*Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds",* Standards Australia 1998. AS/NZ 5667:1998 *Water quality – sampling* and NEPM "*National Environment Protection (Assessment of Site Contamination) Measure".* A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (DEF19009_June 2021 OMP Factual Report_HEH-A). In addition, a Health, Safety and Environment Work Method Statement (HSEWMS) was also prepared. The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.
	Data Representativeness
Use of Composites	No Composites were used during the investigation
Holding Times	Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally compliant with required timeframes. with the exception of the following: **Water:** • pH – generally 10 to 13 days overdue **Sediment:** • pH – generally 2 days overdue • Conductivity – generally 2 days overdue The holding time exceedances for pH and some analytes are due to the Site's remoteness and are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.
Background samples	No background samples were collected as part of this investigation.
Verification of field procedures	The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP. Non-disposable equipment was decontaminated between sample locations.

<table>
<tr><th>QA/QC Aspects</th><th>Evidence & Evaluation</th></tr>
<tr><td colspan="2">Data Precision & Accuracy</td></tr>
<tr><td>QC sample Frequency</td><td>
<table>
<tr><th>QC sample type</th><th>SAQP required frequency</th><th>Sample Collected</th></tr>
<tr><td>Blind duplicate</td><td>1 in 10 primary water samples (10%)
1 in 10 primary sediment samples (10%)</td><td>6 for 48 primary water samples (12.5%)
1 for 6 primary sediment samples (16.7%)</td></tr>
<tr><td>Split duplicate</td><td>1 in 10 primary water samples (10%)
1 in 10 primary sediment samples (10%)</td><td>6 for 48 primary water samples (12.5%)
1 for 6 primary sediment samples (16.7%)</td></tr>
<tr><td>Rinsate</td><td>1 per day / equipment used</td><td>4 (3x equipment for 1 day, 1 x equipment for 1 day) (100%)</td></tr>
<tr><td>Field Blank</td><td>1 per day / field team (esky)</td><td>4 (3x field teams for 1 day, 1 field team for 1 day) (100%)</td></tr>
</table>
QC sample frequency was compliant with the SAQP for water and sediment duplicates, rinsates and field blanks.</td></tr>
<tr><td>QC Testing – Blind Replicates (Primary Lab)</td><td>
▪ Relative Percentage Difference (RPD) Acceptance Criteria:
<table>
<tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr>
<tr><td>< 10 x LOR</td><td>No limits</td></tr>
<tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr>
<tr><td>> 20 x LOR</td><td>0% - 20%</td></tr>
</table>
Groundwater, Seepage water & Surface water
▪ Number of primary samples analysed: 48
▪ Duplicate samples analysed: 6
All RPDs for PFAS were below acceptable range.
Sediment
▪ Number of primary samples analysed: 6
▪ Duplicate samples analysed: 1
All RPDs were below acceptable range with the exception of EC (23%) marginally above the acceptable range.</td></tr>
<tr><td>QC Testing – Field Splits (Secondary Lab)</td><td>
▪ Relative Percentage Difference (RPD) Acceptance Criteria:
<table>
<tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr>
<tr><td>< 10 x LOR</td><td>No limits</td></tr>
<tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr>
<tr><td>> 20 x LOR</td><td>0% - 20%</td></tr>
</table>
Groundwater, Seepage water & Surface water
▪ Number of primary samples Analysed: 48
▪ Field Split Samples Analysed: 6
The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference of methodologies between the primary and secondary laboratories.
Sediment
▪ Number of primary samples analysed: 6
▪ Field Split Samples Analysed: 1
All RPDs were below acceptable range.</td></tr>
<tr><td>Field Blanks</td><td>Field Blanks were collected at a rate of one per field team (esky) per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.</td></tr>
</table>

QA/QC Aspects	Evidence & Evaluation
Laboratory Internal QC	Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and satisfactory results for method blank, laboratory control samples and laboratory duplicates. All Matrix Spikes generally reported recoveries within the acceptance range of 70% to 130% with the exception of the following: ▪ EP2107094, EP2107184, EP2107185, EP2107186 - Sulfate and chloride matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107188 - Sulfate, chloride, PFBS, PFPeS, PFHxS, PFOS & PFHxA matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107191 - PFHxS, PFOS, PFHxA & PFOA matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. All Method Blank results were within acceptable range. All Quality Control sample frequencies were of an acceptable rate with exception of the following: ▪ EP2107186: - Matrix Spikes and Lab duplicates for PFAS were undertaken less than the target rate.
Laboratory Method Detection Limit	Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.
NATA endorsement of laboratory reports	Laboratory reports were stamped with the NATA endorsement stamp and signature. ALS Accreditation No. 825 Eurofins Accreditation No. 1261
Calibration of Field Equipment	All equipment used during the investigation was calibrated by the supplier prior to use. The equipment calibration certificates are provided in Appendix D. Cardno undertook in-field calibration checks (bump tests) for each YSI water quality meters per day of sampling. The bump tests found all parameters to be within the acceptable range. As such, Cardno is satisfied that the equipment calibrations were acceptable for this assessment.
Decontamination and Equipment Blanks	Rinsate blanks were collected at a rate of one per day when reusable equipment is used (i.e. YSI, dipper, trowels/shovels...). All rinsate samples tested reported analytes concentrations below the laboratory LORs.
	Data Comparability
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
	Data Completeness
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process for groundwater and therefore, the data set used as the basis for the investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- A factual report of the condition of a portion of the site or one aspect of an entire site.
- Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- Validation of the success of remediation of a site or a portion of a site.
- Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide "environmental sign-off" of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants' duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the "hot spot" method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

APPENDIX

D

DATA ASSESSMENT

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Table 1 - Groundwater and Seepage Water Results

Site ID	Field ID	Date	Location Code	Multilevel well Screen	Lab Report Number	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides						
						Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)
						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting						0.0004	0.001	0.0002	0.001	0.0002	0.002	0.002	0.0004	0.002	0.0004	0.001	0.002	0.005	0.001	0.05	0.01	0.002	0.001	0.0004	0.0004	0.001	0.01	0.005	0.002	0.005	0.01	0.002	0.05
PFAS HEPA 2020 - Ecological – 99% species protection										*0.00023*						*19*																	
PFAS HEPA 2020 Recreational Water																**10**																	
Site ID	**Field ID**	**Date**	**Location Code**	**Multilevel well Screen**	**Lab Report Number**																												
0083	0083_MW3_180228	28-Feb-18	MW003	-	207612	0.008	0.012	0.24	0.036	3	<0.002	0.061	0.14	0.1	0.031	0.029	<0.002	<0.005	0.004	<0.05	<0.01	<0.002	0.002	0.15	0.02	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW3_180615	15-Jun-18	MW003	-	212374	0.007	0.017	0.28	0.03	2.4	<0.002	0.084	0.19	0.18	0.067	0.06	<0.002	<0.01	0.011	<0.05	<0.02	<0.002	0.007	0.21	0.021	<0.001	<0.02	<0.02	<0.002	<0.01	<0.02	<0.002	<0.05
0083	0083_MW3_191202	02-Dec-19	MW003	-	EP1912746	0.06	0.15	3.09	0.15	15.5	<0.02	1.7	3.28	4.34	2.49	1.34	<0.02	<0.02	0.15	<0.05	<0.02	<0.02	<0.05	3.77	0.18	<0.05	0.03	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW003_200626	26-Jun-20	MW003	-	EP2006686	<0.02	<0.02	0.16	<0.02	2.46	<0.02	<0.1	0.14	0.14	0.04	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.13	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW003_201117	17-Nov-20	MW003	-	EP2012749	<0.02	0.03	0.77	0.04	15.3	<0.02	<0.1	0.61	0.51	0.22	0.18	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	0.42	0.17	<0.05	0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW003_210622	22-Jun-21	MW003	-	EP2107184	<0.02	<0.02	0.04	<0.02	<0.01	<0.02	<0.1	0.06	0.05	0.05	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW8_180228	28-Feb-18	MW008	-	207612	0.012	0.016	0.23	0.022	1.9	<0.002	0.027	0.13	0.047	0.035	0.05	<0.002	<0.005	0.005	<0.05	<0.01	<0.002	<0.001	0.04	0.097	<0.001	<0.01	<0.005	0.003	<0.005	<0.01	<0.002	<0.05
0083	0083_MW8_180616	16-Jun-18	MW008	-	212374	0.082	0.12	2	0.15	13	0.034	0.2	1	0.43	0.29	0.36	0.009	<0.01	0.05	<0.05	<0.02	<0.002	0.001	0.24	0.26	<0.001	0.07	<0.02	<0.002	<0.01	<0.05	<0.004	<0.05
0083	0083_MW8_7.5-8.0_191130	30-Nov-19	MW008	-	EP1912681	0.08	0.1	1.5	0.08	7.42	<0.02	0.6	2.52	1.79	1.4	0.51	<0.02	<0.02	0.08	<0.05	<0.02	<0.02	<0.05	0.31	0.16	<0.05	0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	MW08_200317	17-Mar-20	MW008	-	EP2002947	<0.02	<0.02	0.06	<0.02	0.56	<0.02	<0.1	0.07	0.06	0.03	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW008_200626	26-Jun-20	MW008	-	EP2006686	0.07	0.08	1.07	0.04	7.47	<0.02	0.3	1.18	0.92	0.59	0.27	<0.02	<0.02	0.04	<0.05	<0.02	<0.02	<0.05	0.3	0.25	<0.05	0.04	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW008_201117	17-Nov-20	MW008	-	EP2012749	<0.02	<0.02	<0.02	<0.02	0.4	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW008_210622	22-Jun-21	MW008	-	EP2107184	<0.02	<0.02	<0.02	<0.02	0.08	<0.02	<0.1	0.06	0.06	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.08	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW17_180228	28-Feb-18	MW017	-	207612	0.27	0.34	5.8	0.82	7.8	<0.01	2.5	8.1	7.2	2.6	2.1	<0.01	<0.02	0.08	<0.2	<0.05	<0.01	0.059	21	0.34	<0.005	<0.05	<0.02	<0.01	<0.02	<0.05	<0.01	<0.2
0083	0083_MW17_180616	16-Jun-18	MW017	-	212374	0.24	0.27	5.8	0.77	12	<0.002	1.9	8.8	8	2.5	1.6	<0.002	<0.005	0.068	<0.05	<0.01	<0.002	0.048	24	0.3	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.004	<0.05
0083	0083_MW17_191128	28-Nov-19	MW017	-	EP1912603	0.17	0.19	2.96	0.52	14.2	<0.02	0.6	3.42	3.66	1.14	0.92	<0.02	<0.02	0.11	<0.05	<0.02	<0.02	<0.05	12.2	0.82	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW017_200625	25-Jun-20	MW017	-	EP2006683	0.08	0.07	1.4	0.19	10.1	<0.02	1	3.42	3.34	1.32	0.78	<0.02	<0.02	0.06	<0.05	<0.02	<0.02	<0.05	7.12	0.49	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW017_201118	18-Nov-20	MW017	-	EP2012802	0.05	0.06	1.59	0.18	15.4	<0.02	1	3.35	3.89	1.34	0.8	<0.02	<0.02	0.08	<0.05	<0.02	<0.02	<0.05	3.38	0.3	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW017_210622	22-Jun-21	MW017	-	EP2107095	0.04	0.05	0.98	0.17	9.72	<0.02	0.6	2.08	2.2	0.84	0.54	<0.02	<0.02	0.04	<0.05	<0.02	<0.02	<0.05	5.06	0.81	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW19_180223	23-Feb-18	MW019	-	207359	0.022	0.012	0.1	<0.001	0.016	<0.002	0.072	0.046	<0.002	0.04	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW19_180616	16-Jun-18	MW019	-	212374	0.014	0.013	0.077	<0.001	0.016	<0.002	<0.02	0.028	0.027	<0.01	<0.01	<0.02	<0.1	<0.01	<0.05	<0.02	<0.04	<0.001	<0.001	<0.001	<0.001	<0.1	<0.1	<0.02	<0.1	<0.2	<0.04	<0.1
0083	MW19_200317	17-Mar-20	MW019	-	EP2002947	<0.02	<0.02	0.06	<0.02	<0.01	<0.02	<0.1	<0.02	0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW019_200625	25-Jun-20	MW019	-	EP2006683	<0.02	<0.02	0.07	<0.02	0.03	<0.02	<0.1	<0.02	0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW019_201118	18-Nov-20	MW019	-	EP2012802	<0.02	<0.02	0.03	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW019_210623	23-Jun-21	MW019	-	EP2107188	<0.02	<0.02	0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW27_180223	23-Feb-18	MW027	-	207359	0.022	0.02	0.39	0.008	0.14	<0.002	0.1	0.3	0.23	0.15	0.031	<0.002	<0.005	0.003	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	0.01	<0.01	<0.002	<0.05
0083	0083_MW27_180616	16-Jun-18	MW027	-	212374	0.018	0.019	0.2	0.003	0.088	<0.002	0.046	0.089	0.12	0.059	0.012	<0.004	<0.01	0.003	<0.05	<0.02	<0.004	<0.001	0.002	<0.001	<0.001	<0.1	<0.02	<0.004	<0.02	<0.05	<0.004	<0.05
0083	0083_MW27_191128	28-Nov-19	MW027	-	EP1912603	0.03	<0.02	0.3	<0.02	0.09	<0.02	<0.1	0.12	0.15	0.07	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW027_200625	25-Jun-20	MW027	-	EP2006683	<0.02	<0.02	0.23	<0.02	0.1	<0.02	<0.1	0.06	0.12	0.05	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW027_201118	18-Nov-20	MW027	-	EP2012802	<0.02	<0.02	0.24	<0.02	0.09	<0.02	<0.1	0.08	0.04	0.04	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW027_210623	23-Jun-21	MW027	-	EP2107188	<0.02	<0.02	0.17	<0.02	0.1	<0.02	<0.1	0.03	<0.02	0.04	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW101_180228	28-Feb-18	MW101	-	207612	0.013	<0.005	0.45	<0.005	0.041	<0.01	0.67	0.29	0.21	0.22	0.11	<0.01	<0.02	<0.005	<0.2	<0.05	<0.01	<0.005	0.052	<0.005	<0.005	<0.5	<0.2	<0.1	<0.02	<0.5	<0.1	<0.2
0083	0083_MW101_180616	16-Jun-18	MW101	-	212374	0.022	0.016	0.49	<0.002	0.047	<0.004	0.25	0.32	0.4	0.17	0.047	<0.04	<0.1	<0.02	<0.2	<0.2	<0.04	<0.001	0.042	<0.001	<0.001	<0.2	<0.1	<0.04	<0.2	<0.1	<0.04	<0.5
0083	0083_MW101_200625	25-Jun-20	MW101	-	EP2006683	<0.02	<0.02	0.17	<0.02	<0.01	<0.02	1	<0.02	0.37	0.12	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW101_201118	18-Nov-20	MW101	-	EP2012802	<0.02	<0.02	0.25	<0.02	<0.01	<0.02	<0.1	0.22	<0.02	0.1	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW101_210623	23-Jun-21	MW101	-	EP2107188	0.02	<0.02	0.31	<0.02	<0.01	<0.02	<0.1	0.29	<0.02	0.23	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW102_180228	28-Feb-18	MW102	-	207612	0.055	0.049	0.66	<0.005	0.084	<0.01	0.54	0.85	1.3	0.55	0.12	<0.01	<0.02	0.013	<0.2	<0.05	<0.01	<0.005	0.016	<0.005	<0.005	<0.05	<0.02	<0.01	<0.02	<0.05	<0.01	<0.2
0083	0083_MW102_180616	16-Jun-18	MW102	-	212374	0.037	0.031	0.5	0.006	0.04	<0.002	0.55	0.93	1.3	0.63	0.13	<0.02	<0.02	0.021	<0.05	<0.02	<0.02	<0.001	0.014	<0.001	<0.001	<0.1	<0.1	<0.02	<0.05	<0.1	<0.02	<0.1
0083	0083_MW102_200625	25-Jun-20	MW102	-	EP2006683	<0.02	<0.02	0.17	<0.02	0.05	<0.02	<0.1	<0.02	0.23	0.1	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW102_201118	18-Nov-20	MW102	-	EP2012802	<0.02	0.03	0.39	<0.02	0.06	<0.02	<0.1	0.45	0.32	0.27	0.06	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW102_210622	22-Jun-21	MW102	-	EP2107184	<0.02	<0.02	0.31	<0.02	0.05	<0.02	<0.1	0.6	0.8	0.43	0.1	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW103_180228	28-Feb-18	MW103	-	207612	0.27	0.23	1.2	<0.005	0.11	<0.01	0.97	2.6	2.7	0.56	0.084	<0.01	<0.02	0.006	<0.2	<0.05	<0.01	<0.005	0.039	<0.005	<0.005	<0.05	<0.02	<0.01	<0.02	<0.05	<0.01	<0.2
0083	0083_MW103_180616	16-Jun-18	MW103	-	212374	0.15	0.22	0.93	0.012	0.078	<0.002	0.76	2.1	1.9	0.37	0.051	<0.002	<0.01	0.003	<0.05	<0.01	<0.004	<0.001	0.037	<0.001	<0.001	<0.02	<0.01	<0.002	<0.01	<0.02	<0.002	<0.05
0083	0083_MW103_191128	28-Nov-19	MW103	-	EP1912603	0.2	0.24	1.17	0.02	0.06	<0.02	0.8	2.08	2.55	0.36	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW103_200625	25-Jun-20	MW103	-	EP2006683	0.12	0.11	0.6	<0.02	0.08	<0.02	0.4	1.02	1.12	0.21	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW103_201118	18-Nov-20	MW103	-	EP2012802	0.1	0.07	0.45	<0.02	0.06	<0.02	0.3	0.84	0.94	0.18	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW103_210622	22-Jun-21	MW103	-	EP2107184	0.09	0.08	0.5	<0.02	0.09	<0.02	0.4	1.21	1.48	0.27	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.11	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW104_5.5-6.0_180228	28-Feb-18	MW104	5.5-6.0	207612	0.003	0.002	0.003	<0.001	0.002	<0.002	0.01	0.005	<0.002	0.001	0.003	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW104_7.5-8.0_180228	28-Feb-18	MW104	7.5-8.0	207612	0.007	0.003	<0.001	<0.001	0.002	<0.002	0.007	0.002	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	0.008	<0.01	<0.002	<0.05
0083	0083_MW104_9.5-10.0_180228	28-Feb-18	MW104	9.5-10.0	207612	0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	0.001	0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW104_3.5-4.0_180618	18-Jun-18	MW104	3.5-4.0	212374	0.001	<0.001	0.003	<0.001	0.001	<0.002	0.005	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW104_5.5-6.0_180618	18-Jun-18	MW104	5.5-6.0	212374	0.002	0.002	0.002	<0.001	<0.001	<0.002	0.003	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW104_7.5-8.0_180618	18-Jun-18	MW104	7.5-8.0	212374	0.005	0.002	<0.001	<0.001	<0.001	<0.002	0.003	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW104_9.5-10.0_180618	18-Jun-18	MW104	9.5-10.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	0.002	0.004	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW104_5.5-6.0_191128	28-Nov-19	MW104	5.5-6.0	EP1912603	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW104_200625	25-Jun-20	MW104	3.5-4.0	EP2006683	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW104_201118	18-Nov-20	MW104	5.5-6.0	EP2012904	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW104_210622	22-Jun-21	MW104	5.5-6.0	EP2107184	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW105_2.0-2.5_180303	03-Mar-18	MW105	2.0-2.5	207818	0.014	0.026	0.51	0.07	0.68	<0.002	0.22	0.68	0.37	0.28	0.29	<0.002	<0.005	0.028	<0.05	<0.01	<0.002	<0.001	0.086	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW105_4.0-4.5_180303	03-Mar-18	MW105	4.0-4.5	207818	0.009	0.009	0.069	0.01	0.15	<0.002	0.052	0.15	0.067	0.023	0.021	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	0.14	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW105_6.0-6.5_180303	03-Mar-18	MW105	6.0-6.5	207818	0.027	0.033	0.15	0.006	0.067	<0.002	0.04	0.16	0.037	0.03	0.02	<0.002	<0.005	0.002	<0.05	<0.01	<0.002	<0.001	0.064	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW105_8.0-8.5_180303	03-Mar-18	MW105	8.0-8.5	207818	0.021	0.017	0.037	0.001	0.008	<0.002	0.006	0.039	0.01	0.005	0.003	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.008	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW105-4.0-4.5_180602	02-Jun-18	MW105	4.0-4.5	211639	0.003	0.004	0.04	0.007	0.2	<0.002	0.03	0.096	0.044	0.012	0.007	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.072	0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW105-6.0-6.5_180602	02-Jun-18	MW105	6.0-6.5	211639	0.022	0.019	0.069	0.007	0.04	<0.002	0.01	0.057	0.01	0.007	0.004	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.008	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW105-8.0-8.5_180602	02-Jun-18	MW105	8.0-8.5	211639	0.017	0.012	0.031	<0.001	0.007	<0.002	0.004	0.028	0.009	0.003	0.002	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.003	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW105_4.0-4.5_191128	28-Nov-19	MW105	4.0-4.5	EP1912600	<0.02	<0.02	0.16	<0.02	0.24	<0.02	<0.1	0.27	0.2	0.07	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.33	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW105_200626	26-Jun-20	MW105	4.0-4.5	EP2006686	<0.02	<0.02	0.02	<0.02	0.12	<0.02	<0.1	0.07	0.08	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.13	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW105_201117	17-Nov-20	MW105	4.0-4.5	EP2012749	<0.02	<0.02	0.09	<0.02	0.22	<0.02	<0.1	0.17	0.12	0.06	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.58	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW105_210622	22-Jun-21	MW105	4.0-4.5	EP2107184	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05

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Table 1 - Groundwater and Seepage Water Results

						PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides						
						Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)
						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting						0.0004	0.001	0.0002	0.001	0.0002	0.002	0.002	0.0004	0.002	0.0004	0.001	0.002	0.005	0.001	0.05	0.01	0.002	0.001	0.0004	0.0004	0.001	0.01	0.005	0.002	0.005	0.01	0.002	0.05
PFAS HEPA 2020 - Ecological – 99% species protection										*0.00023*						*19*																	
0083	0083_MW107_3.1-4.1_180303	03-Mar-18	MW107	3.1-4.1	207818	0.004	0.01	0.18	0.013	*0.22*	<0.002	0.071	0.05	0.022	0.024	0.016	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW107_5.5-6.0_180303	03-Mar-18	MW107	5.5-6.0	207818	<0.001	<0.001	<0.001	<0.001	*0.013*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW107_7.5-8.0_180303	03-Mar-18	MW107	7.5-8.0	207818	<0.001	<0.001	0.029	0.014	*0.088*	<0.002	0.003	0.008	0.006	0.002	0.008	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.009	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW107_5.5-6.0_180617	17-Jun-18	MW107	5.5-6.0	212374	<0.001	<0.001	<0.001	<0.001	*0.004*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW107_7.5-8.0_180617	17-Jun-18	MW107	7.5-8.0	212374	<0.001	0.001	0.027	0.006	*0.15*	<0.002	0.002	0.003	0.002	<0.001	0.003	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.005	<0.001	<0.001	<0.01	<0.01	<0.002	0.006	<0.01	<0.002	<0.05
0083	0083_MW107_5.5-6.0_191130	30-Nov-19	MW107	5.5-6.0	EP1912681	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW107_7.5_200626	26-Jun-20	MW107	7.5-8.0	EP2006690	<0.02	<0.02	0.05	<0.02	*0.34*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW107_201117	17-Nov-20	MW107	5.5-6.0	EP2012742	<0.02	<0.02	<0.02	<0.02	*0.05*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW107_210622	22-Jun-21	MW107	3.1-4.1	EP2107185	<0.02	<0.02	<0.02	<0.02	*0.05*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW109_6.5-7.0_180301	01-Mar-18	MW109	6.5-7.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW109_9.3-9.8_180301	01-Mar-18	MW109	9.3-9.8	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW109_6.5-7.0_180620	20-Jun-18	MW109	6.5-7.0	212571	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW109_9.3-9.8_180620	20-Jun-18	MW109	9.3-9.8	212571	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW109_6.5-7.0_191130	30-Nov-19	MW109	6.5-7.0	EP1912681	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW109_200628	28-Jun-20	MW109	9.3-9.8	EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW109_201118	18-Nov-20	MW109	9.3-9.8	EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW109_210622	22-Jun-21	MW109	9.3-9.8	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW110_7.5-8.0_180301	01-Mar-18	MW110	7.5-8.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.003	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW110_9.0-9.5_180301	01-Mar-18	MW110	9.0-9.5	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW110_7.5-8.0_180620	20-Jun-18	MW110	7.5-8.0	212571	<0.001	<0.001	0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW110_9.0-9.5_180620	20-Jun-18	MW110	9.0-9.5	212571	<0.001	<0.001	0.003	<0.001	*0.004*	<0.002	<0.002	0.002	<0.002	0.001	0.002	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW110_200626	26-Jun-20	MW110	9.0-9.5	EP2006686	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW110_201118	18-Nov-20	MW110	9.0-9.5	EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW110_210622	22-Jun-21	MW110	9.0-9.5	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW111_8.5-9.0_180303	03-Mar-18	MW111	8.5-9.0	207818	<0.001	<0.001	0.003	<0.001	*0.007*	<0.002	<0.002	<0.001	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW111_10.5-11.0_180303	03-Mar-18	MW111	10.5-11.0	207818	<0.001	<0.001	0.003	<0.001	*0.012*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW111_8.5-9.0_180617	17-Jun-18	MW111	8.5-9.0	212374	<0.001	<0.001	0.002	<0.001	*0.002*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW111_10.5-11.0_180617	17-Jun-18	MW111	10.5-11.0	212374	<0.001	<0.001	0.003	<0.001	*0.006*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW111_8.5-9.0_191128	28-Nov-19	MW111	8.5-9.0	EP1912603	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW111_10.5_200626	26-Jun-20	MW111	10.5-11.0	EP2006690	<0.02	<0.02	<0.02	<0.02	*0.01*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW111_201118	18-Nov-20	MW111	10.5-11.0	EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW111_210622	22-Jun-21	MW111	10.5-11.0	EP2107185	<0.02	<0.02	<0.02	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW112_2.0-3.0_180303	03-Mar-18	MW112	2.0-3.0	207818	<0.001	<0.001	<0.001	<0.001	*0.005*	<0.002	0.009	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW112_4.5-5.0_180303	03-Mar-18	MW112	4.5-5.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW112_6.5-7.0_180303	03-Mar-18	MW112	6.5-7.0	207818	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW112_8.5-9.0_180303	03-Mar-18	MW112	8.5-9.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.02	<0.01	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW112_2.0-3.0_180617	17-Jun-18	MW112	2.0-3.0	212374	<0.001	<0.001	0.002	<0.001	*0.007*	<0.002	0.01	0.002	<0.002	0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW112_4.5-5.0_180617	17-Jun-18	MW112	4.5-5.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW112_6.5-7.0_180617	17-Jun-18	MW112	6.5-7.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW112_8.5-9.0_180617	17-Jun-18	MW112	8.5-9.0	212374	<0.001	<0.001	<0.001	<0.001	*0.001*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW112_4.5-5.0_191128	28-Nov-19	MW112	4.5-5.0	EP1912600	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW112_200626	26-Jun-20	MW112	4.5-5.0	EP2006686	<0.02	<0.02	<0.02	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.17	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW112_201118	18-Nov-20	MW112	4.5-5.0	EP2012904	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW112_210622	22-Jun-21	MW112	4.5-5.0	EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW113_2.5-3.5_180301	01-Mar-18	MW113	2.5-3.5	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW113_5.0-5.5_180301	01-Mar-18	MW113	5.0-5.5	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.005	<0.01	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.1	<0.005	<0.02	<0.005	<0.01	<0.02	<0.05
0083	0083_MW113_7.0-7.5_180301	01-Mar-18	MW113	7.0-7.5	207818	<0.001	<0.001	0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW113_2.5-3.5_180617	17-Jun-18	MW113	2.5-3.5	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW113_5.0-5.5_180617	17-Jun-18	MW113	5.0-5.5	212374	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	<0.01	<0.02	<0.2	<0.02	<0.02	<0.004	<0.01	<0.005	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.1	<0.02	<0.004	<0.005	<0.02	<0.004	<0.05
0083	0083_MW113_7.0-7.5_180617	17-Jun-18	MW113	7.0-7.5	212374	0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.004	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW113_2.5-3.5_191128	28-Nov-19	MW113	2.5-3.5	EP1912604	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW113_200625	25-Jun-20	MW113	2.5-3.5	EP2006594	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW113_201118	18-Nov-20	MW113	2.5-3.5	EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW113_2.5-3.5_210622	22-Jun-21	MW113	2.5-3.5	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW114_2.0-3.0_180301	01-Mar-18	MW114	2.0-3.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.01	0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW114_4.5-5.0_180301	01-Mar-18	MW114	4.5-5.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW114_6.5-7.0_180301	01-Mar-18	MW114	6.5-7.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW114_8.5-9.0_180301	01-Mar-18	MW114	8.5-9.0	207818	<0.001	<0.001	0.002	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW114_2.0-3.0_180617	17-Jun-18	MW114	2.0-3.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.004	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.004	<0.05
0083	0083_MW114_4.5-5.0_180617	17-Jun-18	MW114	4.5-5.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW114_6.5-7.0_180617	17-Jun-18	MW114	6.5-7.0	212374	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW114_8.5-9.0_180617	17-Jun-18	MW114	8.5-9.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW114_2.0-3.0_191128	28-Nov-19	MW114	2.0-3.0	EP1912604	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW114_200625	25-Jun-20	MW114	2.0-3.0	EP2006594	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW114_201118	18-Nov-20	MW114	2.0-3.0	EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW114_2.0-3.0_210622	22-Jun-21	MW114	2.0-3.0	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW115_2.0-3.0_190302	02-Mar-18	MW115	2.3-2.8	207818	<0.001	<0.001	0.002	<0.001	<0.001	<0.002	0.01	0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW115_4-5-5.0_190302	02-Mar-18	MW115	4.5-5.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW115_6.5-7.0_190302	02-Mar-18	MW115	6.5-7.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW115_8.5-9.0_190302	02-Mar-18	MW115	8.5-9.0	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW115_2.0-3.0_180617	17-Jun-18	MW115	2.3-2.8	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW115_4.5-5.0_180617	17-Jun-18	MW115	4.5-5.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW115_6.5-7.0_180617	17-Jun-18	MW115	6.5-7.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW115_8.5-9.0_180617	17-Jun-18	MW115	8.5-9.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW115_2.0-3.0_191128	28-Nov-19	MW115	4.5-5.0	EP1912604	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW115_200625	25-Jun-20	MW115	2.3-2.8	EP2006594	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW115_201118	18-Nov-20	MW115	4.5-5.0	EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW115_8.5-9.0_210622	22-Jun-21	MW115	8.5-9.0	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW116_1.2-2.2_180303	03-Mar-18	MW116	1.2-2.2	207818	<0.001	<0.001	<0.001	<0.001	*0.003*	<0.002	<0.002	<0.001	<0.002	0.005	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW116_4.5-5.0_180303	03-Mar-18	MW116	4.5-5.0	207818	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	0.004	<0.001	<0.002	0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.01	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW116_6.5 -7.0_180303	03-Mar-18	MW116	6.5-7.0	207818	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	0.01	0.002	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW116_8.5-9.0_180303	03-Mar-18	MW116	8.5-9.0	207818	<0.001	<0.001	<0.001	<0.001	*0.003*	<0.002	0.006	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.007	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_MW116_1.2-2.2_180617	17-Jun-18	MW116	1.2-2.2	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW116_4.5-5.0_180617	17-Jun-18	MW116	4.5-5.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW116_6.5-7.0_180617	17-Jun-18	MW116	6.5-7.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW116_8.5-9.0_180617	17-Jun-18	MW116	8.5-9.0	212374	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_MW116_4.5-5.0_191128	28-Nov-19	MW116	4.5-5.0	EP1912604	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW116_200625	25-Jun-20	MW116	4.5-5.0	EP2006594	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW116_4.5-5.0_210622	22-Jun-21	MW116	4.5-5.0	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05

Table 1 - Groundwater and Seepage Water Results

						PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides						
						Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)
						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting						0.0004	0.001	0.0002	0.001	0.0002	0.002	0.002	0.0004	0.002	0.0004	0.001	0.002	0.005	0.001	0.05	0.01	0.002	0.001	0.0004	0.0004	0.001	0.01	0.005	0.002	0.005	0.01	0.002	0.05
PFAS HEPA 2020 - Ecological – 99% species protection										*0.00023*						*19*																	
0083	**0083_MW117_2.0-2.5_180303**	**03-Mar-18**	**MW117**	**2.0-2.5**	**207818**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_MW117_4.0-4.5_180303**	**03-Mar-18**	**MW117**	**4.0-4.5**	**207818**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.003	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.006	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_MW117_6.0-6.5_180303**	**03-Mar-18**	**MW117**	**6.0-6.5**	**207818**	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	0.005	<0.001	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.019	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_MW117_7.4-7.9_180303**	**03-Mar-18**	**MW117**	**7.4-7.9**	**207818**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_MW117_2.0-2.5_180617**	**17-Jun-18**	**MW117**	**2.0-2.5**	**212374**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_MW117_4.0-4.5_180617**	**17-Jun-18**	**MW117**	**4.0-4.5**	**212374**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.004	<0.05
0083	**0083_MW117_6.0-6.5_180617**	**17-Jun-18**	**MW117**	**6.0-6.5**	**212374**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_MW117_7.4-7.9_180617**	**17-Jun-18**	**MW117**	**7.4-7.9**	**212374**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_MW117_4.0-4.5_191128**	**28-Nov-19**	**MW117**	**4.0-4.5**	**EP1912604**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW117_200623**	**23-Jun-20**	**MW117**	**4.0-4.5**	**EP2006520**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW117_201117**	**17-Nov-20**	**MW117**	**4.0-4.5**	**EP2012742**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW117_6.0-6.5_210622**	**22-Jun-21**	**MW117**	**6.0-6.5**	**EP2107095**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW119_180301**	**01-Mar-18**	**MW119**	**-**	**207818**	0.89	1.4	9.6	0.068	*0.067*	<0.002	0.26	3.1	0.68	0.21	0.13	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_MW119_180617**	**17-Jun-18**	**MW119**	**-**	**212374**	0.87	1.2	10	0.18	*0.091*	<0.002	0.3	2.5	0.67	0.21	0.13	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	0.005	<0.02	<0.002	<0.05
0083	**0083_MW119_191128**	**28-Nov-19**	**MW119**	**-**	**EP1912603**	0.47	0.6	4.18	0.04	*0.06*	<0.02	0.4	1.52	0.47	0.06	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW119_200625**	**25-Jun-20**	**MW119**	**-**	**EP2006683**	1.15	1.62	12.4	0.13	*0.19*	<0.02	0.5	4.83	1.4	0.29	0.22	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW119_201117**	**17-Nov-20**	**MW119**	**-**	**EP2012749**	0.95	1.82	8.02	0.09	*0.1*	<0.02	0.4	3.96	1.21	0.24	0.14	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW119_210623**	**23-Jun-21**	**MW119**	**-**	**EP2107188**	0.94	1.26	7.73	0.07	*0.11*	<0.02	0.4	2.99	1.04	0.26	0.16	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW123_180228**	**28-Feb-18**	**MW123**	**-**	**207612**	<0.001	<0.001	<0.001	<0.001	*0.001*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_MW123_180615**	**15-Jun-18**	**MW123**	**-**	**212374**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	<0.002	<0.005	<0.05	<0.002	<0.05
0083	**0083_MW123_191128**	**28-Nov-19**	**MW123**	**-**	**EP1912607**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW123_200625**	**25-Jun-20**	**MW123**	**-**	**EP2006683**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW123_201118**	**18-Nov-20**	**MW123**	**-**	**EP2012904**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW129_1.5-2.0_180617**	**17-Jun-18**	**MW129**	**1.5-2.0**	**212374**	<0.001	<0.001	0.004	<0.001	*0.008*	<0.002	0.023	<0.005	<0.01	<0.005	0.007	<0.004	<0.01	<0.005	<0.05	<0.01	<0.004	<0.001	0.006	<0.001	<0.001	<0.1	<0.02	<0.004	<0.005	<0.02	<0.004	<0.05
0083	**0083_MW129_5.5-6.0_180617**	**17-Jun-18**	**MW129**	**5.5-6.0**	**212374**	0.001	<0.001	0.006	<0.001	*0.01*	<0.002	0.004	0.009	0.003	0.003	0.011	0.006	<0.01	0.002	<0.05	<0.01	<0.004	<0.001	0.006	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_MW129_9.5-10.0_180617**	**17-Jun-18**	**MW129**	**9.5-10.0**	**212374**	<0.001	<0.001	0.004	<0.001	*0.002*	<0.002	0.002	<0.005	<0.002	<0.005	0.014	<0.004	<0.01	<0.005	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.1	<0.02	<0.004	<0.01	<0.02	<0.004	<0.05
0083	**0083_MW129_13.5-14.0_18017**	**17-Jun-18**	**MW129**	**13.5-14.0**	**212374**	0.001	<0.001	0.012	<0.001	*0.018*	<0.002	0.008	0.013	0.002	0.004	0.016	0.004	<0.01	0.003	<0.05	<0.01	<0.004	<0.001	0.009	<0.001	<0.001	<0.02	<0.02	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_MW129_5.5-6.0_191128**	**28-Nov-19**	**MW129**	**5.5-6.0**	**EP1912600**	<0.02	<0.02	0.04	<0.02	*0.07*	<0.02	<0.1	0.07	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	2.3	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW129_200623**	**23-Jun-20**	**MW129**	**5.5-6.0**	**EP2006520**	<0.02	<0.02	<0.02	<0.02	*0.02*	<0.02	<0.1	0.06	0.16	0.04	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW129_201117**	**17-Nov-20**	**MW129**	**1.5-2.0**	**EP2012743**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW129_210622**	**22-Jun-21**	**MW129**	**1.5-2.0**	**EP2107184**	<0.02	<0.02	0.03	<0.02	*0.72*	<0.02	<0.1	0.03	0.03	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW130_1.4-1.9_180617**	**17-Jun-18**	**MW130**	**1.4-1.9**	**212374**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.003	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.004	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_MW130_3.4-3.9_180617**	**17-Jun-18**	**MW130**	**3.4-3.9**	**212374**	<0.001	<0.001	0.002	<0.001	*0.005*	<0.002	0.005	<0.01	<0.002	<0.01	<0.01	<0.02	<0.05	<0.01	<0.05	<0.02	<0.02	<0.001	0.004	<0.001	<0.001	<0.1	<0.1	<0.02	<0.1	<0.1	<0.02	<0.5
0083	**0083_MW130_5.4-5.9_180617**	**17-Jun-18**	**MW130**	**5.4-5.9**	**212374**	<0.001	<0.001	0.002	<0.001	*0.003*	<0.002	0.003	0.002	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.004	<0.001	0.002	<0.001	<0.001	<0.05	<0.02	<0.002	<0.02	<0.05	<0.002	<0.05
0083	**0083_MW130_7.4-7.9_180617**	**17-Jun-18**	**MW130**	**7.4-7.9**	**212374**	<0.001	<0.001	<0.001	<0.001	*0.005*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.02	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_MW130_3.4-3.9_191128**	**28-Nov-19**	**MW130**	**3.4-3.9**	**EP1912600**	<0.02	<0.02	<0.02	<0.02	*0.01*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.25	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW130_200623**	**23-Jun-20**	**MW130**	**1.4-1.9**	**EP2006455**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW130_201117**	**17-Nov-20**	**MW130**	**1.4-1.9**	**EP2012743**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW130_210622**	**22-Jun-21**	**MW130**	**1.4-1.9**	**EP2107184**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW134_180623**	**23-Jun-18**	**MW134**	**-**	**212781**	<0.001	<0.001	0.002	<0.001	*0.005*	<0.002	0.002	0.004	0.006	0.001	0.003	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.02	<0.01	<0.004	<0.01	<0.02	<0.004	<0.05
0083	**0083_MW134_191128**	**28-Nov-19**	**MW134**	**-**	**EP1912600**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.06	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW134_200623**	**23-Jun-20**	**MW134**	**-**	**EP2006455**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW134_201117**	**17-Nov-20**	**MW134**	**-**	**EP2012743**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW134_210622**	**22-Jun-21**	**MW134**	**-**	**EP2107184**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_AB20_180303**	**03-Mar-18**	**MW202**	**-**	**207818**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_AB20_180620**	**20-Jun-18**	**MW202**	**-**	**212571**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_AB20_191128**	**28-Nov-19**	**MW202**	**-**	**EP1912603**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW202_200626**	**26-Jun-20**	**MW202**	**-**	**EP2006686**	<0.02	<0.02	<0.02	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW202_201118**	**18-Nov-20**	**MW202**	**-**	**EP2012854**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW202_210622**	**22-Jun-21**	**MW202**	**-**	**EP2107185**	<0.02	<0.02	<0.02	<0.02	*0.04*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_B02_180228**	**28-Feb-18**	**MW210**	**-**	**207612**	0.003	0.003	0.017	<0.001	*0.002*	<0.002	0.01	0.021	0.01	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_B02_180613**	**13-Jun-18**	**MW210**	**-**	**212152**	0.005	0.007	0.076	<0.001	*0.003*	<0.002	0.028	0.058	0.041	0.012	0.004	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_B02_191128**	**28-Nov-19**	**MW210**	**-**	**EP1912600**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.08	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**B02_200317**	**17-Mar-20**	**MW210**	**-**	**EP2002947**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW210_200626**	**26-Jun-20**	**MW210**	**-**	**EP2006686**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW210_201117**	**17-Nov-20**	**MW210**	**-**	**EP2012749**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW210_210622**	**22-Jun-21**	**MW210**	**-**	**EP2107184**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_B04_180303**	**03-Mar-18**	**MW212**	**-**	**207818**	<0.001	<0.001	0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_B04**	**02-Jun-18**	**MW212**	**-**	**211639**	<0.001	<0.001	0.006	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_B04_191128**	**28-Nov-19**	**MW212**	**-**	**EP1912600**	<0.02	<0.02	0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.13	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**B04_200317**	**17-Mar-20**	**MW212**	**-**	**EP2002947**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW212_200626**	**26-Jun-20**	**MW212**	**-**	**EP2006686**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW212_201117**	**17-Nov-20**	**MW212**	**-**	**EP2012749**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW212_210622**	**22-Jun-21**	**MW212**	**-**	**EP2107184**	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_BDDBO5_180223**	**23-Feb-18**	**MW213**	**-**	**207359**	0.01	0.009	0.063	<0.001	*0.027*	<0.002	0.34	<0.001	0.18	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_BODB5_180616**	**16-Jun-18**	**MW213**	**-**	**212374**	0.012	0.009	0.071	<0.001	*0.02*	<0.002	0.02	0.017	<0.02	<0.01	0.004	<0.004	<0.01	<0.002	<0.05	<0.02	<0.004	<0.001	<0.001	<0.001	<0.001	<0.1	<0.02	<0.004	<0.02	<0.02	<0.004	<0.1
0083	**0083_BDDBO5_191128**	**28-Nov-19**	**MW213**	**-**	**EP1912603**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW213_210623**	**23-Jun-21**	**MW213**	**-**	**EP2107188**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_B05_180227**	**27-Feb-18**	**MW214**	**-**	**207612**	0.009	0.004	0.017	<0.001	*0.011*	<0.002	0.027	0.01	0.008	0.01	0.004	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_B05_180616**	**16-Jun-18**	**MW214**	**-**	**212374**	0.008	0.004	0.03	<0.001	*0.013*	<0.002	0.031	0.024	0.02	0.018	0.006	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	**0083_B05_191128**	**28-Nov-19**	**MW214**	**-**	**EP1912603**	<0.02	<0.02	0.02	<0.02	*0.04*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW213_200625**	**25-Jun-20**	**MW214**	**-**	**EP2006683**	<0.02	<0.02	0.03	<0.02	*0.04*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW213_201118**	**18-Nov-20**	**MW214**	**-**	**EP2012904**	<0.02	<0.02	<0.02	<0.02	*0.03*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_MW214_210622**	**22-Jun-21**	**MW214**	**-**	**EP2107095**	<0.02	<0.02	0.04	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05

Table 1 - Groundwater and Seepage Water Results

						PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides						
						Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)
						µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting						0.0004	0.001	0.0002	0.001	0.0002	0.002	0.002	0.0004	0.002	0.0004	0.001	0.002	0.005	0.001	0.05	0.01	0.002	0.001	0.0004	0.0004	0.001	0.01	0.005	0.002	0.005	0.01	0.002	0.05
PFAS HEPA 2020 - Ecological – 99% species protection										*0.00023*						*19*																	
0083	0083_B09_180302	02-Mar-18	MW217	-	207818	<0.001	<0.001	0.001	<0.001	*0.004*	<0.002	<0.002	<0.001	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_B09_180618	16-Jun-18	MW217	-	212374	<0.001	<0.001	<0.001	<0.001	*0.003*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_B09_191128	28-Nov-19	MW217	-	EP1912604	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW217_200626	26-Jun-20	MW217	-	EP2006690	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW217_201118	18-Nov-20	MW217	-	EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW217_210622	22-Jun-21	MW217	-	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_B10_180302	02-Mar-18	MW218	-	207818	<0.001	<0.001	0.001	<0.001	*0.003*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	0.005	<0.01	<0.002	<0.05
0083	0083_B10_180618	16-Jun-18	MW218	-	212374	<0.001	<0.001	0.001	<0.001	*0.003*	<0.002	0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_B10_191128	28-Nov-19	MW218	-	EP1912604	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW218_200626	26-Jun-20	MW218	-	EP2006690	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW218_201117	17-Nov-20	MW218		EP2012743	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_MW218_210622	22-Jun-21	MW218	-	EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH002_180227	27-Feb-18	OTH002		207612	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.003	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH002_180606	06-Jun-18	OTH002		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.009	0.002	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH002_201117	17-Nov-20	OTH002		EP2012742	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH002_210622	22-Jun-21	OTH002		EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH101_180212	12-Feb-18	OTH101		206780	<0.0004	<0.001	0.001	<0.001	*0.003*	<0.002	<0.002	<0.0004	<0.002	<0.0004	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.021	<0.0004	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH101_A_180620	20-Jun-18	OTH101		212571	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_OTH101_B_180620	20-Jun-18	OTH101		212571	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_OTH101_191128	28-Nov-19	OTH101		EP1912603	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH101_200628	28-Jun-20	OTH101		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH101_201118	18-Nov-20	OTH101		EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH101_210622	22-Jun-21	OTH101		EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH102_180212	12-Feb-18	OTH102		206780	<0.0004	<0.001	<0.0002	<0.001	<0.0002	<0.002	<0.002	<0.0004	<0.002	0.003	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.0004	<0.0004	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH102_A_180620	20-Jun-18	OTH102		212571	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_OTH102_B_180620	20-Jun-18	OTH102		212571	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_OTH102_191128	28-Nov-19	OTH102		EP1912603	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH002_200627	27-Jun-20	OTH102		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH102_200628	28-Jun-20	OTH102		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH102_201118	18-Nov-20	OTH102		EP2012854	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH102_210622	22-Jun-21	OTH102		EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH103_180212	12-Feb-18	OTH103		206780	<0.0004	<0.001	0.002	<0.001	*0.004*	<0.002	<0.002	0.001	<0.002	0.003	0.003	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	0.005	<0.0004	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH103_A_180609	09-Jun-18	OTH103		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH103_B_180609	09-Jun-18	OTH103		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH103_191130	30-Nov-19	OTH103		EP1912684	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH103_200627	27-Jun-20	OTH103		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH103_201117	17-Nov-20	OTH103		EP2012742	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_oth103_210622	22-Jun-21	OTH103		EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH104_180212	12-Feb-18	OTH104		206780	<0.0004	<0.001	<0.0002	<0.001	<0.0002	<0.002	<0.002	<0.0004	<0.002	0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.0004	<0.0004	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH104_A_180609	09-Jun-18	OTH104		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH104_B_180609	09-Jun-18	OTH104		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH104_191128	28-Nov-19	OTH104		EP1912605	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH104_200627	27-Jun-20	OTH104		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH104_201118	18-Nov-20	OTH104		EP2012904	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH104_210622	22-Jun-21	OTH104		EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH105_180221	21-Feb-18	OTH105		207287	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH105_A_180609	09-Jun-18	OTH105		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH105_B_180609	09-Jun-18	OTH105		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH105_191128	28-Nov-19	OTH105		EP1912605	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH105_200627	27-Jun-20	OTH105		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH105_201117	17-Nov-20	OTH105		EP2012742	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH105_210622	22-Jun-21	OTH105		EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH106_180221	21-Feb-18	OTH106		207287	<0.001	<0.001	0.002	<0.001	*0.003*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH106_A_180609	09-Jun-18	OTH106		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH106_B_180609	09-Jun-18	OTH106		212095	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	<0.002	<0.001	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH106_191128	28-Nov-19	OTH106		EP1912605	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH106_200627	27-Jun-20	OTH106		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH106_201117	17-Nov-20	OTH106		EP2012742	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH106_210622	22-Jun-21	OTH106		EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH107_180212	12-Feb-18	OTH107		206780	<0.0004	<0.001	<0.0002	<0.001	<0.0002	<0.002	<0.002	<0.0004	<0.002	<0.0004	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.0004	<0.0004	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH107_A_180623	23-Jun-18	OTH107		212781	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.004	<0.01	<0.02	<0.004	<0.05
0083	0083_OTH107_B_180623	23-Jun-18	OTH107		212781	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.02	<0.01	<0.004	<0.01	<0.02	<0.004	<0.05
0083	0083_OTH107_191128	28-Nov-19	OTH107		EP1912605	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH107_200627	27-Jun-20	OTH107		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH107_201117	17-Nov-20	OTH107		EP2012742	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH107_210622	22-Jun-21	OTH107		EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH108_180212	12-Feb-18	OTH108		206780	<0.0004	<0.001	<0.0002	<0.001	<0.0002	<0.002	<0.002	<0.0004	<0.002	<0.0004	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.0004	<0.0004	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH108_A_180610	10-Jun-18	OTH108		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH108_B_180610	10-Jun-18	OTH108		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH108_191128	28-Nov-19	OTH108		EP1912605	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH108_200627	27-Jun-20	OTH108		EP2006692	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH108_201117	17-Nov-20	OTH108		EP2012742	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH108_210622	22-Jun-21	OTH108		EP2107095	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH110_A_180620	20-Jun-18	OTH110		212571	<0.001	<0.001	<0.001	<0.001	*0.003*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.005	<0.02	<0.002	<0.05
0083	0083_OTH110_B_180620	20-Jun-18	OTH110		212571	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.01	<0.001	<0.05	<0.02	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.002	0.009	<0.02	<0.002	<0.05
0083	0083_OTH110_191128	28-Nov-19	OTH110		EP1912600	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH110_200626	26-Jun-20	OTH110		EP2006686	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH110_201118	18-Nov-20	OTH110		EP2012904	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH110_210622	22-Jun-21	OTH110		EP2107185	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH113_A_180610	10-Jun-18	OTH113		212095	<0.001	<0.001	<0.001	<0.001	*0.005*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH113_B_180610	10-Jun-18	OTH113		212095	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	0083_OTH113_191128	28-Nov-19	OTH113		EP1912600	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH113_200628	28-Jun-20	OTH113		EP2006748	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH113_201117	17-Nov-20	OTH113		EP2012743	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	0083_OTH113_210622	22-Jun-21	OTH113		EP2107184	<0.02	<0.02	0.02	<0.02	*0.54*	<0.02	<0.1	<0.02	0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Interim Marine 99%
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Table 1 - Groundwater and Seepage Water Results

						PFAS			Inorganics																Metals			Organic
						Sum of PFAS (WA DER List)	Sum of FFHtS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	Sulphate	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
						µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting						0.01	0.001	0.001	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	1	5	1	5	0.1	0.1	0.1	1
PFAS HEPA 2020 - Ecological – 99% species protection																											
PFAS HEPA 2020 Recreational Water							**2**																				
Site ID	**Field ID**	**Date**	**Location Code**	**Multilevel well Screen**	**Lab Report Numb**																						
0083	**0083_MW3_180228**	**28-Feb-18**	**MW003**	-	**207612**		**3.24**			250					8,500	0.11	7.6	4,800		1,500	17,000			230	610	170	
0083	**0083_MW3_180615**	**15-Jun-18**	**MW003**	-	**212374**		**2.68**			250					8,600	1.6		5,000		1,400	17,000			240	610	180	
0083	**0083_MW3_191202**	**02-Dec-19**	**MW003**	-	**EP1912746**	35.8	**18.6**	36.2	<1	252	<1	252	160	163	5,080	0.91	7.91	2,700	569		9,550		164	211	383	142	15
0083	**0083_MW003_200626**	**26-Jun-20**	**MW003**	-	**EP2006686**	3.11	**2.62**	3.11	<1	284	<1	284	175	162	5,590	3.84	7.91	2,760	580		10,500		45	214	344	133	12
0083	**0083_MW003_201117**	**17-Nov-20**	**MW003**	-	**EP2012749**	18.2	**16.1**	18.3	<1	294	<1	294	200	181	6,360	4.84	7.81	3,020	701		11,100		204	233	415	167	12
0083	**0083_MW003_210622**	**22-Jun-21**	**MW003**	-	**EP2107184**	0.21	0.04	0.21	<1	245	<1	245	319	319	10,200	0.01	7.71	5,370	1,260		20,000		285	304	759	295	5
0083	**0083_MW8_180228**	**28-Feb-18**	**MW008**	-	**207612**		2.13			220					8,700	0.94	7.7	5,000		1,500	17,000			240	620	180	
0083	**0083_MW8_180616**	**16-Jun-18**	**MW008**	-	**212374**		**15**			260					5,700	1.8		3,400		860	11,000			190	370	110	
0083	**0083_MW8_7.5-8.0_191130**	**30-Nov-19**	**MW008**	-	**EP1912681**	16.3	**8.92**	16.6	<1	235	<1	235	138	139	4,330	0.42	7.78	2,360	528		8,530		1,750	161	308	116	13
0083	**MW08_200317**	**17-Mar-20**	**MW008**	-	**EP2002947**	0.79	0.62	0.79											1,290								
0083	**0083_MW008_200626**	**26-Jun-20**	**MW008**	-	**EP2006686**	12.4	**8.54**	12.6	<1	242	<1	242	213	197	6,790	3.97	7.89	3,360	819		12,900		2,300	214	441	156	6
0083	**0083_MW008_201117**	**17-Nov-20**	**MW008**	-	**EP2012749**	0.4	0.4	0.4	<1	226	<1	226	310	309	9,860	0.08	7.77	5,250	1,300		19,700		328	269	732	282	2
0083	**0083_MW008_210622**	**22-Jun-21**	**MW008**	-	**EP2107184**	0.28	0.08	0.28	<1	218	<1	218	329	330	10,500	0.14	7.73	5,590	1,380		21,300		451	294	784	306	3
0083	**0083_MW17_180228**	**28-Feb-18**	**MW017**	-	**207612**		**13.6**			290					8,900	1.6	7.4	5,400		1,800	19,000			260	610	220	
0083	**0083_MW17_180616**	**16-Jun-18**	**MW017**	-	**212374**		**17.8**			290					9,300	1.3		5,500		1,600	19,000			270	620	220	
0083	**0083_MW17_191128**	**28-Nov-19**	**MW017**	-	**EP1912603**	40.1	**17.2**	40.9	<1	297	<1	297	297	349	9,210	7.99	7.67	5,910	1,520		18,500		88	341	801	352	7
0083	**0083_MW017_200625**	**25-Jun-20**	**MW017**	-	**EP2006683**	29	**11.5**	29.4	<1	387	<1	387	261	257	7,930	0.74	7.81	4,350	1,410		15,600		40	274	577	256	9
0083	**0083_MW017_201118**	**18-Nov-20**	**MW017**	-	**EP2012802**	31.1	**17**	31.4	<1	368	<1	368	205	219	6,300	3.36	7.77	3,700	964		14,200		368	238	494	232	15
0083	**0083_MW017_210622**	**22-Jun-21**	**MW017**	-	**EP2107095**	22.9	**10.7**	23.1	<1	281	<1	281	298	304	9,340	0.88	7.69	5,100	1,410		21,200		<5	316	707	312	9
0083	**0083_MW19_180223**	**23-Feb-18**	**MW019**	-	**207359**		0.116			330					4,300	0.43	7.5	2,500		740	9,300			150	300	98	
0083	**0083_MW19_180616**	**16-Jun-18**	**MW019**	-	**212374**		0.093			360					8,700	1.1		5,000		1,300	18,000			250	600	190	
0083	**MW19_200317**	**17-Mar-20**	**MW019**	-	**EP2002947**	0.11	0.06	0.11																			
0083	**0083_MW019_200625**	**25-Jun-20**	**MW019**	-	**EP2006683**	0.12	0.1	0.12	<1	334	<1	334	239	218	7,450	4.5	7.76	3,740	1,060		14,300		48	212	482	211	41
0083	**0083_MW019_201118**	**18-Nov-20**	**MW019**	-	**EP2012802**	0.03	0.03	0.03	<1	330	<1	330	306	318	9,600	1.98	7.66	5,470	1,380		20,100		88	282	710	314	40
0083	**0083_MW019_210623**	**23-Jun-21**	**MW019**	-	**EP2107188**	0.02	0.02	0.02	<1	317	<1	317	296	323	9,300	4.51	7.62	5,570	1,290		21,700		38	286	718	306	43
0083	**0083_MW27_180223**	**23-Feb-18**	**MW027**	-	**207359**		0.53			340					5,300	-2.1	7.5	3,000		1,100	12,000			210	360	110	
0083	**0083_MW27_180616**	**16-Jun-18**	**MW027**	-	**212374**		0.288			320					7,900	2.3		4,800		1,400	16,000			260	530	170	
0083	**0083_MW27_191128**	**28-Nov-19**	**MW027**	-	**EP1912603**	0.78	0.39	0.78	<1	334	<1	334	251	275	7,710	4.71	7.76	4,610	1,270		15,400		46	318	637	257	32
0083	**0083_MW027_200625**	**25-Jun-20**	**MW027**	-	**EP2006683**	0.57	0.33	0.57	<1	336	<1	336	239	218	7,350	4.41	7.76	3,680	1,180		14,300		40	260	487	209	20
0083	**0083_MW027_201118**	**18-Nov-20**	**MW027**	-	**EP2012802**	0.5	0.33	0.5	<1	355	<1	355	277	280	8,690	0.48	7.74	4,760	1,210		18,600		72	295	624	272	24
0083	**0083_MW027_210623**	**23-Jun-21**	**MW027**	-	**EP2107188**	0.34	0.27	0.34	<1	356	<1	356	280	328	8,770	7.78	7.51	5,580	1,240		19,100		189	341	730	304	28
0083	**0083_MW101_180228**	**28-Feb-18**	**MW101**	-	**207612**		0.491			700					6,800	3.2	7.4	4,100		420	13,000			160	460	140	
0083	**0083_MW101_180616**	**16-Jun-18**	**MW101**	-	**212374**		0.537			520					5,700	-0.0081		3,300		550	12,000			150	370	110	
0083	**0083_MW101_200625**	**25-Jun-20**	**MW101**	-	**EP2006683**	0.4	0.24	0.4	<1	705	<1	705	280	265	8,830	2.74	7.79	4,550	788		16,100		25	202	611	249	154
0083	**0083_MW101_201118**	**18-Nov-20**	**MW101**	-	**EP2012802**	0.59	0.25	0.59	<1	686	<1	686	258	278	8,100	3.81	7.56	4,760	754		18,400	142	4,030	218	651	267	
0083	**0083_MW101_210623**	**23-Jun-21**	**MW101**	-	**EP2107188**	0.9	0.31	0.9	<1	772	<1	772	229	234	7,300	0.98	7.82	4,020	389		14,700		355	182	542	213	
0083	**0083_MW102_180228**	**28-Feb-18**	**MW102**	-	**207612**		0.744			270					4,700	0.8	7.5	2,800		970	9,800			180	310	110	
0083	**0083_MW102_180616**	**16-Jun-18**	**MW102**	-	**212374**		0.54			280					5,600	0.031		3,300		920	12,000			190	350	120	
0083	**0083_MW102_200625**	**25-Jun-20**	**MW102**	-	**EP2006683**	0.55	0.22	0.55	<1	343	<1	343	274	258	8,520	2.99	7.8	4,430	1,290		16,400		21	257	562	249	57
0083	**0083_MW102_201118**	**18-Nov-20**	**MW102**	-	**EP2012802**	1.55	0.45	1.58	<1	285	<1	285	242	238	7,580	0.79	7.73	4,050	1,070		16,200		88	254	525	233	50
0083	**0083_MW102_210622**	**22-Jun-21**	**MW102**	-	**EP2107184**	2.29	0.36	2.29	<1	231	<1	231	126	120	3,950	2.68	7.8	2,010	496		8,200		150	143	268	123	29
0083	**0083_MW103_180228**	**28-Feb-18**	**MW103**	-	**207612**		1.31			300					3,700	0.44	7.5	2,200		910	8,100			180	280	92	
0083	**0083_MW103_180616**	**16-Jun-18**	**MW103**	-	**212374**		1.008			280					4,900	-0.41		2,800		920	10,000			190	320	110	
0083	**0083_MW103_191128**	**28-Nov-19**	**MW103**	-	**EP1912603**	7.26	1.23	7.52	<1	362	<1	362	136	140	3,940	1.13	7.81	2,320	875		8,460		903	190	318	123	9
0083	**0083_MW103_200625**	**25-Jun-20**	**MW103**	-	**EP2006683**	3.58	0.68	3.69	<1	284	<1	284	214	189	6,530	6.02	7.87	3,180	1,140		12,100		32	233	422	183	9
0083	**0083_MW103_201118**	**18-Nov-20**	**MW103**	-	**EP2012802**	2.89	0.51	2.96	<1	307	<1	307	223	222	6,920	0.4	7.74	3,720	1,060		14,400		327	261	500	220	8
0083	**0083_MW103_210622**	**22-Jun-21**	**MW103**	-	**EP2107184**	4.19	0.59	4.27	<1	284	<1	284	218	181	6,790	9.48	7.71	3,020	1,020		11,600		378	226	404	185	9
0083	**0083_MW104_5.5-6.0_180228**	**28-Feb-18**	**MW104**	**5.5-6.0**	**207612**		0.005			270					4,100	75	7.6	18,000		1,200	9,000			770	2,000	640	
0083	**0083_MW104_7.5-8.0_180228**	**28-Feb-18**	**MW104**	**7.5-8.0**	**207612**		0.002			250					4,200	0.98	7.6	2,700		1,300	9,300			140	330	110	
0083	**0083_MW104_9.5-10.0_180228**	**28-Feb-18**	**MW104**	**9.5-10.0**	**207612**		<0.001			250					11,000	1.2	7.5	6,300		2,000	22,000			280	710	240	
0083	**0083_MW104_3.5-4.0_180618**	**18-Jun-18**	**MW104**	**3.5-4.0**	**212374**		0.004			910					2,800	-11		1,400		870	5,400			200	220	59	
0083	**0083_MW104_5.5-6.0_180618**	**18-Jun-18**	**MW104**	**5.5-6.0**	**212374**		0.002			280					4,200	0.28		2,400		990	9,300			200	320	93	
0083	**0083_MW104_7.5-8.0_180618**	**18-Jun-18**	**MW104**	**7.5-8.0**	**212374**		<0.001			250					4,400	1.4		2,700		1,100	9,900			150	340	110	
0083	**0083_MW104_9.5-10.0_180618**	**18-Jun-18**	**MW104**	**9.5-10.0**	**212374**		<0.001			250					11,000	1.6		6,200		1,800	23,000			290	730	230	
0083	**0083_MW104_5.5-6.0_191128**	**28-Nov-19**	**MW104**	**5.5-6.0**	**EP1912603**	0.01	0.01	0.01	<1	225	<1	225	146	148	4,250	0.79	8.04	2,440	1,020		8,860		32	179	360	127	9
0083	**0083_MW104_200625**	**25-Jun-20**	**MW104**	**3.5-4.0**	**EP2006683**	0.02	0.02	0.02	<1	266	<1	266	174	158	5,190	4.79	7.92	2,580	1,070		9,590		169	193	391	159	5
0083	**0083_MW104_201118**	**18-Nov-20**	**MW104**	**5.5-6.0**	**EP2012904**	<0.01	<0.01	<0.01	<1	245	<1	245	161	158	4,820	0.84	7.95	2,620	956		10,100		352	179	383	143	3
0083	**0083_MW104_210622**	**22-Jun-21**	**MW104**	**5.5-6.0**	**EP2107184**	<0.01	<0.01	<0.01	<1	257	<1	257	160	162	4,810	0.51	7.8	2,660	934		10,400		3,630	189	393	173	6
0083	**0083_MW105_2.0-2.5_180303**	**03-Mar-18**	**MW105**	**2.0-2.5**	**207818**		1.2			490					1,400	-3.1		810		120	3,200			120	82	33	
0083	**0083_MW105_4.0-4.5_180303**	**03-Mar-18**	**MW105**	**4.0-4.5**	**207818**		0.2			270					9,900	-1.5		5,400		1,400	16,000			240	640	190	
0083	**0083_MW105_6.0-6.5_180303**	**03-Mar-18**	**MW105**	**6.0-6.5**	**207818**		0.2			420					12,000	-0.91		6,600		1,800	22,000			370	630	180	
0083	**0083_MW105_8.0-8.5_180303**	**03-Mar-18**	**MW105**	**8.0-8.5**	**207818**		<0.001			300					12,000	-1.4		6,600		1,600	18,000			290	760	230	
0083	**0083_MW105-4.0-4.5_180602**	**02-Jun-18**	**MW105**	**4.0-4.5**	**211639**		0.25			340					9,500	1.1		5,500		1,400				250	680	200	
0083	**0083_MW105-6.0-6.5_180602**	**02-Jun-18**	**MW105**	**6.0-6.5**	**211639**		0.11			720					11,000	0.15		6,600		1,500				330	740	210	
0083	**0083_MW105-8.0-8.5_180602**	**02-Jun-18**	**MW105**	**8.0-8.5**	**211639**		0.038			310					11,000	2.9		6,600		1,500				280	790	230	
0083	**0083_MW105_4.0-4.5_191128**	**28-Nov-19**	**MW105**	**4.0-4.5**	**EP1912600**	1.3	0.4	1.3	<1	265	<1	265	302	340	9,550	5.9	7.92	5,740	1,330		19,000		228	312	815	312	8
0083	**0083_MW105_200626**	**26-Jun-20**	**MW105**	**4.0-4.5**	**EP2006686**	0.42	0.14	0.42	<1	258	<1	258	328	304	10,400	3.75	7.8	5,180	1,420		20,000		2,270	273	704	293	11
0083	**0083_MW105_201117**	**17-Nov-20**	**MW105**	**4.0-4.5**	**EP2012749**	1.27	0.31	1.27	<1	269	<1	269	338	325	10,800	1.92	7.72	5,500	1,320		20,300		10,200	287	771	305	2
0083	**0083_MW105_210622**	**22-Jun-21**	**MW105**	**4.0-4.5**	**EP2107184**	<0.01	<0.01	<0.01	<1	244	<1	244	332	326	10,700	1.02	7.69	5,480	1,230		21,300		393	288	789	309	8

Table 1 - Groundwater and Seepage Water Results

						PFAS			Inorganics															Metals			Organic
						Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	Sulphate	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
						µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting						0.01	0.001	0.001	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	1	5	1	5	0.1	0.1	0.1	1
PFAS HEPA 2020 - Ecological – 99% species protection																											
0083	0083_MW107_3.1-4.1_180303	03-Mar-18	MW107	3.1-4.1	207818		0.4			260					4,800	-1.7		2,500		360	8,900			130	290	97	
0083	0083_MW107_5.5-6.0_180303	03-Mar-18	MW107	5.5-6.0	207818		<0.001			740					20,000	-1.6		11,000		3,400	39,000			410	1,300	390	
0083	0083_MW107_7.5-8.0_180303	03-Mar-18	MW107	7.5-8.0	207818		0.1			130					20,000	-0.57		11,000		3,400	39,000			420	1,300	390	
0083	0083_MW107_5.5-6.0_180617	17-Jun-18	MW107	5.5-6.0	212374		0.004			130					20,000	1.1		11,000		2,700	39,000			400	1,300	370	
0083	0083_MW107_7.5-8.0_180617	17-Jun-18	MW107	7.5-8.0	212374		0.177			130					20,000	0.49		11,000		2,800	40,000			410	1,300	370	
0083	0083_MW107_5.5-6.0_191130	30-Nov-19	MW107	5.5-6.0	EP1912681	<0.01	<0.01	<0.01	<1	167	<1	167	590	700	19,000	8.52	7.7	12,100	2,440		38,400		3,270	487	1,610	662	11
0083	0083_MW107_7.5_200626	26-Jun-20	MW107	7.5-8.0	EP2006690	0.39	0.39	0.39	<1	129	<1	129	586	583	18,700	0.32	7.72	10,200	2,710		39,400		92	641	1,140	521	4
0083	0083_MW107_201117	17-Nov-20	MW107	5.5-6.0	EP2012742	0.05	0.05	0.05	<1	166	<1	166	611	652	19,500	3.21	7.68	11,300	2,770		38,400		2,020	498	1,450	621	21
0083	0083_MW107_210622	22-Jun-21	MW107	3.1-4.1	EP2107185	0.05	0.05	0.05	<1	153	<1	153	601	675	19,200	5.8	7.67	11,700	2,720		41,800		11,400	492	1,520	658	5
0083	0083_MW109_6.5-7.0_180301	01-Mar-18	MW109	6.5-7.0	207818		<0.001			140					16,000	-1.1		8,800		2,100	31,000			340	1,000	290	
0083	0083_MW109_9.3-9.8_180301	01-Mar-18	MW109	9.3-9.8	207818		<0.001			150					20,000	-1.5		11,000		2,700	39,000			390	1,300	390	
0083	0083_MW109_6.5-7.0_180620	20-Jun-18	MW109	6.5-7.0	212571		<0.001			120					17,000	8.8		11,000		2,200	37,000			390	1,300	380	
0083	0083_MW109_9.3-9.8_180620	20-Jun-18	MW109	9.3-9.8	212571		0.002			110					18,000	10		12,000		2,300	37,000			400	1,300	420	
0083	0083_MW109_6.5-7.0_191130	30-Nov-19	MW109	6.5-7.0	EP1912681	<0.01	<0.01	<0.01	<1	125	<1	125	629	703	20,200	5.54	7.56	12,200	2,720		40,300		25	468	1,600	664	28
0083	0083_MW109_200628	28-Jun-20	MW109	9.3-9.8	EP2006692	<0.01	<0.01	<0.01	<1	134	<1	134	591	662	18,900	5.73	7.69	11,500	2,640		37,600		108	490	1,480	629	2
0083	0083_MW109_201118	18-Nov-20	MW109	9.3-9.8	EP2012854	<0.01	<0.01	<0.01	<1	116	<1	116	600	642	19,200	3.34	7.64	11,200	2,710		42,700		141	450	1,440	536	6
0083	0083_MW109_210622	22-Jun-21	MW109	9.3-9.8	EP2107185	<0.01	<0.01	<0.01	<1	104	<1	104	591	635	18,900	3.62	7.74	11,000	2,660		42,000		19	448	1,440	614	<1
0083	0083_MW110_7.5-8.0_180301	01-Mar-18	MW110	7.5-8.0	207818		<0.001			290					6,000	1.9		3,600		620	12,000			150	360	130	
0083	0083_MW110_9.0-9.5_180301	01-Mar-18	MW110	9.0-9.5	207818		<0.001			56					19,000	-0.6		11,000		2,600	38,000			370	1,200	360	
0083	0083_MW110_7.5-8.0_180620	20-Jun-18	MW110	7.5-8.0	212571		0.002			230					8,800	8.5		5,900		1,100	18,000			230	620	210	
0083	0083_MW110_9.0-9.5_180620	20-Jun-18	MW110	9.0-9.5	212571		0.007			110					18,000	7.6		12,000		2,300	37,000			390	1,300	400	
0083	0083_MW110_200626	26-Jun-20	MW110	9.0-9.5	EP2006686	<0.01	<0.01	<0.01	<1	154	<1	154	580	621	18,600	3.41	7.65	10,800	2,500		39,100		23	481	1,380	523	10
0083	0083_MW110_201118	18-Nov-20	MW110	9.0-9.5	EP2012854	<0.01	<0.01	<0.01	<1	208	<1	208	584	621	18,600	3.12	7.47	10,800	2,630		40,600		444	475	1,390	518	43
0083	0083_MW110_210622	22-Jun-21	MW110	9.0-9.5	EP2107185	<0.01	<0.01	<0.01	<1	154	<1	154	582	625	18,600	3.56	7.66	10,800	2,620		35,100		102	466	1,420	605	23
0083	0083_MW111_8.5-9.0_180303	03-Mar-18	MW111	8.5-9.0	207818		<0.001			200					15,000	3.9		9,300		2,500	30,000			350	1,100	300	
0083	0083_MW111_10.5-11.0_180303	03-Mar-18	MW111	10.5-11.0	207818		<0.001			100					20,000	2.2		12,000		3,400	38,000			410	1,400	410	
0083	0083_MW111_8.5-9.0_180617	17-Jun-18	MW111	8.5-9.0	212374		0.004			170					16,000	2		9,300		2,100	32,000			350	1,100	310	
0083	0083_MW111_10.5-11.0_180617	17-Jun-18	MW111	10.5-11.0	212374		0.009			120					19,000	0.51		11,000		2,700	39,000			390	1,300	360	
0083	0083_MW111_8.5-9.0_191128	28-Nov-19	MW111	8.5-9.0	EP1912603	<0.01	<0.01	<0.01	<1	198	<1	198	422	502	13,500	8.6	7.8	8,670	1,800		26,400		43,100	367	1,150	453	13
0083	0083_MW111_10.5_200626	26-Jun-20	MW111	10.5-11.0	EP2006690	0.01	0.01	0.01	<1	165	<1	165	475	471	15,200	0.36	7.75	8,180	2,050		31,200		167	402	1,010	482	6
0083	0083_MW111_201118	18-Nov-20	MW111	10.5-11.0	EP2012854	<0.01	<0.01	<0.01	<1	360	<1	360	524	548	16,700	2.22	7.68	9,500	2,190		36,500		187	443	1,180	594	8
0083	0083_MW111_210622	22-Jun-21	MW111	10.5-11.0	EP2107185	0.02	0.02	0.02	<1	666	<1	666	569	638	18,000	5.74	7.96	11,000	2,290		36,300		134	496	1,440	636	9
0083	0083_MW112_2.0-3.0_180303	03-Mar-18	MW112	2.0-3.0	207818		<0.001			120					18,000	2		11,000		3,200	36,000			440	1,200	380	
0083	0083_MW112_4.5-5.0_180303	03-Mar-18	MW112	4.5-5.0	207818		<0.001			140					20,000	1.2		11,000		3,300	39,000			430	1,300	400	
0083	0083_MW112_6.5-7.0_180303	03-Mar-18	MW112	6.5-7.0	207818		<0.001			130					20,000	2.5		12,000		3,400	39,000			450	1,400	420	
0083	0083_MW112_8.5-9.0_180303	03-Mar-18	MW112	8.5-9.0	207818		<0.001			190					20,000	-3.3		11,000		3,500	39,000			470	1,200	350	
0083	0083_MW112_2.0-3.0_180617	17-Jun-18	MW112	2.0-3.0	212374		0.009			130					11,000	-0.067		6,400		1,500	23,000			260	690	230	
0083	0083_MW112_4.5-5.0_180617	17-Jun-18	MW112	4.5-5.0	212374		<0.001			140					20,000	0.17		11,000		2,700	38,000			410	1,300	370	
0083	0083_MW112_6.5-7.0_180617	17-Jun-18	MW112	6.5-7.0	212374		<0.001			130					20,000	0.19		11,000		2,700	37,000			410	1,300	360	
0083	0083_MW112_8.5-9.0_180617	17-Jun-18	MW112	8.5-9.0	212374		0.001			180					19,000	2.7		11,000		2,600	37,000			460	1,300	360	
0083	0083_MW112_4.5-5.0_191128	28-Nov-19	MW112	4.5-5.0	EP1912600	0.05	<0.01	0.05	<1	160	<1	160	558	637	17,900	6.58	7.83	11,000	2,400		36,600		13,000	482	1,440	612	7
0083	0083_MW112_200626	26-Jun-20	MW112	4.5-5.0	EP2006686	0.19	0.02	0.19	<1	150	<1	150	599	620	19,200	1.74	7.71	10,800	2,600		38,200		1,340	464	1,380	526	12
0083	0083_MW112_201118	18-Nov-20	MW112	4.5-5.0	EP2012904	<0.01	<0.01	<0.01	<1	135	<1	135	596	649	19,000	4.23	7.79	11,300	2,750		39,200		306	461	1,460	545	2
0083	0083_MW112_210622	22-Jun-21	MW112	4.5-5.0	EP2107185	<0.01	<0.01	<0.01	<1	130	<1	130	589	664	18,800	6.04	7.76	11,500	2,680		42,300		28	481	1,500	653	1
0083	0083_MW113_2.5-3.5_180301	01-Mar-18	MW113	2.5-3.5	207818		<0.001			300					20,000	-2.1		11,000		2,800	39,000			400	1,300	380	
0083	0083_MW113_5.0-5.5_180301	01-Mar-18	MW113	5.0-5.5	207818		<0.001			170					20,000	-0.73		11,000		2,900	38,000			520	1,100	320	
0083	0083_MW113_7.0-7.5_180301	01-Mar-18	MW113	7.0-7.5	207818		<0.001			150					21,000	-3.2		11,000		2,800	38,000			420	1,200	380	
0083	0083_MW113_2.5-3.5_180617	17-Jun-18	MW113	2.5-3.5	212374		<0.001			120					20,000	-1.7		11,000		2,600	38,000			390	1,200	360	
0083	0083_MW113_5.0-5.5_180617	17-Jun-18	MW113	5.0-5.5	212374		<0.001			200					20,000	1.2		12,000		2,700	38,000			520	1,200	330	
0083	0083_MW113_7.0-7.5_180617	17-Jun-18	MW113	7.0-7.5	212374		<0.001			170					20,000	1.9		11,000		2,500	37,000			430	1,300	410	
0083	0083_MW113_2.5-3.5_191128	28-Nov-19	MW113	2.5-3.5	EP1912604	<0.01	<0.01	<0.01	<1	147	<1	147	532	595	16,900	5.64	7.77	10,300	2,490		33,500		7,620	453	1,330	586	6
0083	0083_MW113_200625	25-Jun-20	MW113	2.5-3.5	EP2006594	<0.01	<0.01	<0.01	<1	144	<1	144	602	602	19,200	0.03	7.74	10,500	2,780		36,800		1,330	427	1,350	503	4
0083	0083_MW113_201118	18-Nov-20	MW113	2.5-3.5	EP2012854	<0.01	<0.01	<0.01	<1	140	<1	140	586	626	18,700	3.27	7.64	10,900	2,680		41,200	6	974	444	1,410	524	
0083	0083_MW113_2.5-3.5_210622	22-Jun-21	MW113	2.5-3.5	EP2107095	<0.01	<0.01	<0.01	<1	133	<1	133	556	671	17,900	9.36	7.73	11,600	2,330		38,700		2,620	491	1,520	655	2
0083	0083_MW114_2.0-3.0_180301	01-Mar-18	MW114	2.0-3.0	207818		<0.001			2,600					20,000	-5.1		11,000		2,600	38,000			560	1,200	320	
0083	0083_MW114_4.5-5.0_180301	01-Mar-18	MW114	4.5-5.0	207818		<0.001			2,100					20,000	-5.1		11,000		2,700	38,000			400	1,300	380	
0083	0083_MW114_6.5-7.0_180301	01-Mar-18	MW114	6.5-7.0	207818		<0.001			140					17,000	7		11,000		2,300	39,000			410	1,300	380	
0083	0083_MW114_8.5-9.0_180301	01-Mar-18	MW114	8.5-9.0	207818		<0.001			220					20,000	-2.1		11,000		2,800	39,000			410	1,300	380	
0083	0083_MW114_2.0-3.0_180617	17-Jun-18	MW114	2.0-3.0	212374		<0.001			150					19,000	-0.37		10,000		2,300	37,000			410	1,300	380	
0083	0083_MW114_4.5-5.0_180617	17-Jun-18	MW114	4.5-5.0	212374		<0.001			130					8,900	38		11,000		1,200	37,000			410	1,300	370	
0083	0083_MW114_6.5-7.0_180617	17-Jun-18	MW114	6.5-7.0	212374		0.002			140					20,000	-0.46		11,000		2,600	37,000			400	1,200	360	
0083	0083_MW114_8.5-9.0_180617	17-Jun-18	MW114	8.5-9.0	212374		<0.001			130					21,000	-3.3		11,000		2,600	37,000			390	1,200	370	
0083	0083_MW114_2.0-3.0_191128	28-Nov-19	MW114	2.0-3.0	EP1912604	<0.01	<0.01	<0.01	<1	129	<1	129	579	574	18,400	0.44	7.71	9,900	2,770		36,900		198	411	1,320	566	11
0083	0083_MW114_200625	25-Jun-20	MW114	2.0-3.0	EP2006594	<0.01	<0.01	<0.01	<1	160	<1	160	610	641	19,500	2.44	7.68	11,200	2,750		37,000		10,400	456	1,430	528	11
0083	0083_MW114_201118	18-Nov-20	MW114	2.0-3.0	EP2012854	<0.01	<0.01	<0.01	<1	158	<1	158	581	656	18,400	6.08	7.62	11,400	2,810		43,100	10	18,200	482	1,480	553	
0083	0083_MW114_2.0-3.0_210622	22-Jun-21	MW114	2.0-3.0	EP2107095	<0.01	<0.01	<0.01	<1	157	<1	157	598	526	19,300	6.44	7.66	9,040	2,420		42,900		3,880	390	1,220	490	7
0083	0083_MW115_2.0-3.0_190302	02-Mar-18	MW115	2.3-2.8	207818		<0.001			1,900					19,000	-5.4		10,000		2,600	36,000			540	1,200	290	
0083	0083_MW115_4.5-5.0_190302	02-Mar-18	MW115	4.5-5.0	207818		<0.001			2,600					19,000	-5		10,000		2,600	36,000			390	1,200	360	
0083	0083_MW115_6.5-7.0_190302	02-Mar-18	MW115	6.5-7.0	207818		<0.001			410					19,000	-0.36		11,000		2,600	38,000			400	1,200	370	
0083	0083_MW115_8.5-9.0_190302	02-Mar-18	MW115	8.5-9.0	207818		<0.001			160					19,000	-0.65		11,000		2,600	38,000			400	1,200	360	
0083	0083_MW115_2.0-3.0_180617	17-Jun-18	MW115	2.3-2.8	212374		<0.001			170					19,000	-2.3		10,000		2,200	34,000			390	1,200	330	
0083	0083_MW115_4.5-5.0_180617	17-Jun-18	MW115	4.5-5.0	212374		<0.001			160					19,000	-2.9		10,000		2,400	34,000			380	1,200	330	
0083	0083_MW115_6.5-7.0_180617	17-Jun-18	MW115	6.5-7.0	212374		<0.001			150					20,000	-2.7		10,000		2,400	35,000			380	1,200	340	
0083	0083_MW115_8.5-9.0_180617	17-Jun-18	MW115	8.5-9.0	212374		<0.001			150					20,000	-3.7		10,000		2,500	36,000			380	1,200	340	
0083	0083_MW115_2.0-3.0_191128	28-Nov-19	MW115	4.5-5.0	EP1912604	<0.01	<0.01	<0.01	<1	184	<1	184	541	594	17,200	4.67	7.72	10,200	2,490		31,300		27,800	487	1,350	572	2
0083	0083_MW115_200625	25-Jun-20	MW115	2.3-2.8	EP2006594	<0.01	<0.01	<0.01	<1	174	<1	174	599	604	19,100	0.45	7.76	10,500	2,720		35,700		8,100	452	1,360	511	3
0083	0083_MW115_201118	18-Nov-20	MW115	4.5-5.0	EP2012854	<0.01	<0.01	<0.01	<1	171	<1	171	585	615	18,700	2.5	7.72	10,700	2,580		40,000	4	21,500	452	1,380	512	
0083	0083_MW115_8.5-9.0_210622	22-Jun-21	MW115	8.5-9.0	EP2107095	<0.01	<0.01	<0.01	<1	168	<1	168	544	638	17,500	7.98	7.76	11,000	2,250		38,400		182	472	1,460	623	6
0083	0083_MW116_1.2-2.2_180303	03-Mar-18	MW116	1.2-2.2	207818		<0.001			1,000					20,000	-1.3		11,000		2,300	39,000			410	1,300	390	
0083	0083_MW116_4.5-5.0_180303	03-Mar-18	MW116	4.5-5.0	207818		<0.001			150					21,000	-1.2		11,000		2,800	33,000			420	1,300	380	
0083	0083_MW116_6.5 -7.0_180303	03-Mar-18	MW116	6.5-7.0	207818		<0.001			140					21,000	-3.6		11,000		3,800	40,000			420	1,300	380	
0083	0083_MW116_8.5-9.0_180303	03-Mar-18	MW116	8.5-9.0	207818		<0.001			120					21,000	-0.86		11,000		2,700	39,000			410	1,300	380	
0083	0083_MW116_1.2-2.2_180617	17-Jun-18	MW116	1.2-2.2	212374		<0.001			110					18,000	-5.5		9,100		2,200	33,000			330	1,100	310	
0083	0083_MW116_4.5-5.0_180617	17-Jun-18	MW116	4.5-5.0	212374		<0.001			120					20,000	-0.39		11,000		2,600	38,000			400	1,300	370	
0083	0083_MW116_6.5-7.0_180617	17-Jun-18	MW116	6.5-7.0	212374		<0.001			120					20,000	2		12,000		2,600	38,000			430	1,300	390	
0083	0083_MW116_8.5-9.0_180617	17-Jun-18	MW116	8.5-9.0	212374		<0.001			120					20,000	-1		11,000		2,600	38,000			390	1,200	360	
0083	0083_MW116_4.5-5.0_191128	28-Nov-19	MW116	4.5-5.0	EP1912604	<0.01	<0.01	<0.01	<1	133	<1	133	573	665	18,300	7.38	7.76	11,500	2,620		36,800		39	489	1,500	657	7
0083	0083_MW116_200625	25-Jun-20	MW116	4.5-5.0	EP2006594	<0.01	<0.01	<0.01	<1	133	<1	133	611	636	19,500	2	7.66	11,100	2,820		38,300		22	448	1,430	527	2
0083	0083_MW116_4.5-5.0_210622	22-Jun-21	MW116	4.5-5.0	EP2107095	<0.01	<0.01	<0.01	<1	110	<1	110	581	646	18,800	5.35	7.72	11,200	2,310		42,700		12	458	1,460	630	2

Table 1 - Groundwater and Seepage Water Results

						PFAS			Inorganics															Metals			Organic
						Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	Sulphate	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
						µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting						0.01	0.001	0.001	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	1	5	1	5	0.1	0.1	0.1	1
PFAS HEPA 2020 - Ecological – 99% species protection																											
0083	0083_MW117_2.0-2.5_180303	03-Mar-18	MW117	2.0-2.5	207818		<0.001			920					20,000	-1.6		11,000		2,700	39,000			430	1,300	390	
0083	0083_MW117_4.0-4.5_180303	03-Mar-18	MW117	4.0-4.5	207818		<0.001			150					20,000	0.41		11,000		2,600	39,000			410	1,300	390	
0083	0083_MW117_6.0-6.5_180303	03-Mar-18	MW117	6.0-6.5	207818		<0.001			150					21,000	-1.8		11,000		2,700	40,000			440	1,300	370	
0083	0083_MW117_7.4-7.9_180303	03-Mar-18	MW117	7.4-7.9	207818		<0.001			140					21,000	-2		11,000		2,800	40,000			410	1,300	380	
0083	0083_MW117_2.0-2.5_180617	17-Jun-18	MW117	2.0-2.5	212374		<0.001			130					20,000	-0.13		11,000		2,600	37,000			400	1,200	360	
0083	0083_MW117_4.0-4.5_180617	17-Jun-18	MW117	4.0-4.5	212374		<0.001			130					20,000	1.1		11,000		2,600	38,000			400	1,300	380	
0083	0083_MW117_6.0-6.5_180617	17-Jun-18	MW117	6.0-6.5	212374		<0.001			130					20,000	-0.78		11,000		2,600	38,000			400	1,300	370	
0083	0083_MW117_7.4-7.9_180617	17-Jun-18	MW117	7.4-7.9	212374		<0.001			130					21,000	-4.2		11,000		3,900	38,000			400	1,300	370	
0083	0083_MW117_4.0-4.5_191128	28-Nov-19	MW117	4.0-4.5	EP1912604	<0.01	<0.01	<0.01	<1	150	<1	150	582	653	18,600	5.76	7.75	11,300	2,620		37,800		5,690	488	1,470	648	15
0083	0083_MW117_200623	23-Jun-20	MW117	4.0-4.5	EP2006520	<0.01	<0.01	<0.01	<1	151	<1	151	614	690	19,600	5.86	7.72	12,200	2,790		42,200		5,790	468	1,490	541	3
0083	0083_MW117_201117	17-Nov-20	MW117	4.0-4.5	EP2012742	<0.01	<0.01	<0.01	<1	128	<1	128	600	713	19,100	8.63	7.72	12,400	2,810		38,900		23,300	510	1,590	682	<1
0083	0083_MW117_6.0-6.5_210622	22-Jun-21	MW117	6.0-6.5	EP2107095	<0.01	<0.01	<0.01	<1	136	<1	136	610	692	19,700	6.36	7.72	12,000	2,460		41,500		258	493	1,560	686	3
0083	0083_MW119_180301	01-Mar-18	MW119	-	207818		9.7			280					7,400	-1.2		4,000		810	14,000			190	460	150	
0083	0083_MW119_180617	17-Jun-18	MW119	-	212374		10.09			270					7,900	-0.26		4,500		1,100	15,000			190	490	140	
0083	0083_MW119_191128	28-Nov-19	MW119	-	EP1912603	7.2	4.24	7.84	<1	291	<1	291	258	281	8,250	4.13	7.83	4,800	957		16,200		10,400	243	641	277	6
0083	0083_MW119_200625	25-Jun-20	MW119	-	EP2006683	21	12.6	22.7	<1	282	<1	282	240	229	7,680	2.47	7.85	3,970	880		14,100		66	184	499	237	7
0083	0083_MW119_201117	17-Nov-20	MW119	-	EP2012749	15	8.12	16.9	<1	266	<1	266	260	242	8,370	3.49	7.84	4,150	890		15,200		102	203	551	252	6
0083	0083_MW119_210623	23-Jun-21	MW119	-	EP2107188	13.6	7.84	15	<1	272	<1	272	249	268	8,010	3.65	7.8	4,620	857		16,700		89	214	604	265	8
0083	0083_MW123_180228	28-Feb-18	MW123	-	207612		0.001			160					23,000	1.9	7.4	14,000		3,700	45,000			500	1,500	470	
0083	0083_MW123_180615	15-Jun-18	MW123	-	212374		<0.001			150					23,000	2.6		14,000		3,100	44,000			510	1,500	480	
0083	0083_MW123_191128	28-Nov-19	MW123	-	EP1912607	<0.01	<0.01	<0.01	<1	158	<1	158	712	856	22,300	9.16	7.64	14,800	3,860		44,400	14	1,150	639	1,960	755	
0083	0083_MW123_200625	25-Jun-20	MW123	-	EP2006683	<0.01	<0.01	<0.01	<1	149	<1	149	708	728	22,600	1.32	7.61	12,700	3,270		44,000		309	530	1,620	601	2
0083	0083_MW123_201118	18-Nov-20	MW123	-	EP2012904	<0.01	<0.01	<0.01	<1	139	<1	139	683	739	21,800	3.93	7.58	12,900	3,140		45,100		524	544	1,640	614	2
0083	0083_MW129_1.5-2.0_180617	17-Jun-18	MW129	1.5-2.0	212374		0.012			280					15,000	1.1		8,700		2,100	29,000			470	880	250	
0083	0083_MW129_5.5-6.0_180617	17-Jun-18	MW129	5.5-6.0	212374		0.016			98					9,500	1.3		5,500		1,400	18,000			260	600	200	
0083	0083_MW129_9.5-10.0_180617	17-Jun-18	MW129	9.5-10.0	212374		0.006			150					18,000	7.2		12,000		2,500	36,000			500	1,300	370	
0083	0083_MW129_13.5-14.0_18017	17-Jun-18	MW129	13.5-14.0	212374		0.03			70					15,000	4		8,900		1,800	28,000			420	960	290	
0083	0083_MW129_5.5-6.0_191128	28-Nov-19	MW129	5.5-6.0	EP1912600	2.48	0.11	2.48	<1	152	<1	152	486	565	15,600	7.48	7.8	9,810	2,070		31,900		200	460	1,240	513	12
0083	0083_MW129_200623	23-Jun-20	MW129	5.5-6.0	EP2006520	0.28	0.02	0.28	<1	161	<1	161	500	549	16,000	4.64	7.97	9,690	2,180		33,700		37	436	1,140	452	6
0083	0083_MW129_201117	17-Nov-20	MW129	1.5-2.0	EP2012743	<0.01	<0.01	<0.01	<1	260	<1	260	599	562	19,400	3.17	7.53	9,690	2,250		35,300	14	39,700	468	1,270	513	
0083	0083_MW129_210622	22-Jun-21	MW129	1.5-2.0	EP2107184	0.81	0.75	0.81	<1	308	<1	308	561	626	18,200	5.43	7.53	10,800	2,000		37,400	30	61,700	539	1,390	572	
0083	0083_MW130_1.4-1.9_180617	17-Jun-18	MW130	1.4-1.9	212374		<0.001			340					17,000	-3.1		9,000		2,500	33,000			370	1,100	300	
0083	0083_MW130_3.4-3.9_180617	17-Jun-18	MW130	3.4-3.9	212374		0.007			260					17,000	2.1		10,000		2,600	34,000			500	1,100	300	
0083	0083_MW130_5.4-5.9_180617	17-Jun-18	MW130	5.4-5.9	212374		0.005			250					18,000	1.6		10,000		2,600	35,000			420	1,200	350	
0083	0083_MW130_7.4-7.9_180617	17-Jun-18	MW130	7.4-7.9	212374		0.005			220					19,000	-0.13		11,000		3,800	36,000			430	1,200	370	
0083	0083_MW130_3.4-3.9_191128	28-Nov-19	MW130	3.4-3.9	EP1912600	0.26	0.01	0.26	<1	266	<1	266	538	648	17,100	9.28	7.8	11,200	2,420		35,400		217	489	1,480	576	16
0083	0083_MW130_200623	23-Jun-20	MW130	1.4-1.9	EP2006455	<0.01	<0.01	<0.01	<1	272	<1	272	554	611	17,700	4.9	7.68	10,700	2,370		37,300		712	456	1,340	499	13
0083	0083_MW130_201117	17-Nov-20	MW130	1.4-1.9	EP2012743	<0.01	<0.01	<0.01	<1	285	<1	285	593	583	19,000	0.87	7.64	10,000	2,480		33,000	6	14,500	440	1,360	553	
0083	0083_MW130_210622	22-Jun-21	MW130	1.4-1.9	EP2107184	<0.01	<0.01	<0.01	<1	326	<1	326	579	614	18,700	2.96	7.54	10,500	2,150		38,500		4,180	482	1,440	579	9
0083	0083_MW134_180623	23-Jun-18	MW134	-	212781		0.008	0.02		180					14,000	9.3		9,200		1,700	29,000			430	940	330	
0083	0083_MW134_191128	28-Nov-19	MW134	-	EP1912600	0.06	<0.01	0.06	<1	187	<1	187	432	522	13,900	9.38	7.84	9,180	1,750		27,500		10,000	442	1,070	482	7
0083	0083_MW134_200623	23-Jun-20	MW134	-	EP2006455	<0.01	<0.01	<0.01	<1	262	<1	262	478	500	15,200	2.29	7.7	8,860	2,120		31,700		4,620	424	988	498	3
0083	0083_MW134_201117	17-Nov-20	MW134	-	EP2012743	<0.01	<0.01	<0.01	<1	176	<1	176	485	483	15,600	0.16	7.7	8,450	1,980		27,000	5	25,800	428	1,000	469	
0083	0083_MW134_210622	22-Jun-21	MW134	-	EP2107184	<0.01	<0.01	<0.01	<1	184	<1	184	430	510	13,900	8.49	7.58	8,900	1,670		30,600		269	465	1,060	505	4
0083	0083_AB20_180303	03-Mar-18	MW202	-	207818		<0.001			210					16,000	-2.6		8,100		2,100	30,000			340	1,000	310	
0083	0083_AB20_180620	20-Jun-18	MW202	-	212571		<0.001			170					14,000	1.9		8,100		1,800	30,000			300	930	280	
0083	0083_AB20_191128	28-Nov-19	MW202	-	EP1912603	<0.01	<0.01	<0.01	<1	348	<1	348	399	465	12,800	7.67	7.67	8,140	1,490		25,100		118	321	1,020	444	8
0083	0083_MW202_200626	26-Jun-20	MW202	-	EP2006686	0.02	0.02	0.02	<1	304	<1	304	415	418	13,300	0.43	7.83	7,330	1,610		25,900		24	313	880	449	<1
0083	0083_MW202_201118	18-Nov-20	MW202	-	EP2012854	<0.01	<0.01	<0.01	<1	253	<1	253	503	519	16,100	1.54	7.67	8,990	2,120		33,700		50	373	1,160	548	<1
0083	0083_MW202_210622	22-Jun-21	MW202	-	EP2107185	0.04	0.04	0.04	<1	174	<1	174	568	654	18,200	6.98	7.64	11,300	2,470		38,900		117	461	1,490	641	3
0083	0083_B02_180228	28-Feb-18	MW210	-	207612		0.019			310					8,100	3.4	7.6	5,000		1,300	16,000			240	590	180	
0083	0083_B02_180613	13-Jun-18	MW210	-	212152		0.079			300					7,300	30		4,100		980				1,100	2,400	37	
0083	0083_B02_191128	28-Nov-19	MW210	-	EP1912600	0.08	<0.01	0.08	<1	294	<1	294	242	276	7,630	6.48	7.97	4,660	1,020		15,200		344	275	644	255	3
0083	B02_200317	17-Mar-20	MW210	-	EP2002947	<0.01	<0.01	<0.01											1,020								
0083	0083_MW210_200626	26-Jun-20	MW210	-	EP2006686	<0.01	<0.01	<0.01	<1	264	<1	264	264	245	8,390	3.73	7.9	4,180	1,060		15,700		48	250	543	236	5
0083	0083_MW210_201117	17-Nov-20	MW210	-	EP2012749	<0.01	<0.01	<0.01	<1	259	<1	259	268	270	8,540	0.34	7.78	4,550	1,080		16,800		68	263	642	254	3
0083	0083_MW210_210622	22-Jun-21	MW210	-	EP2107184	<0.01	<0.01	<0.01	<1	265	<1	265	284	292	9,100	1.3	7.71	4,910	1,070		18,800		93	289	689	276	4
0083	0083_B04_180303	03-Mar-18	MW212	-	207818		<0.001			200					9,900	-3.3		5,200		1,200	19,000			220	590	190	
0083	0083_B04	02-Jun-18	MW212	-	211639		0.006			240					8,600	-0.44		4,800		1,100	17,000			210	530	170	
0083	0083_B04_191128	28-Nov-19	MW212	-	EP1912600	0.15	0.02	0.15	<1	254	<1	254	258	279	8,260	4	7.93	4,770	954		16,500		449	256	638	261	3
0083	B04_200317	17-Mar-20	MW212	-	EP2002947	<0.01	<0.01	<0.01											1,350								
0083	0083_MW212_200626	26-Jun-20	MW212	-	EP2006686	<0.01	<0.01	<0.01	<1	238	<1	238	282	263	9,070	3.41	7.92	4,550	1,020		17,100		8	245	565	258	4
0083	0083_MW212_201117	17-Nov-20	MW212	-	EP2012749	<0.01	<0.01	<0.01	<1	214	<1	214	357	350	11,500	0.96	7.78	6,000	1,370		20,600		130	290	808	330	2
0083	0083_MW212_210622	22-Jun-21	MW212	-	EP2107184	0.03	0.03	0.03	<1	216	<1	216	374	343	12,200	4.3	7.73	5,850	1,230		22,400		51	297	797	326	3
0083	0083_BDDBO5_180223	23-Feb-18	MW213	-	207359		0.09			530					1,200	0.43	7.4	720		120	3,300			130	110	35	
0083	0083_BODB5_180616	16-Jun-18	MW213	-	212374		0.091			460					1,500	-0.7		830		220	3,500			140	140	40	
0083	0083_BDDBO5_191128	28-Nov-19	MW213	-	EP1912603	<0.01	<0.01	<0.01	<1	324	<1	324	32.1	31.5	810	0.97	7.93	428	135		1,890		259	102	84	35	13
0083	0083_MW213_210623	23-Jun-21	MW213	-	EP2107188	<0.01	<0.01	<0.01	<1	471	<1	471	49.7	44.2	1,360	5.78	7.79	614	91		2,740		22	130	119	49	
0083	0083_B05_180227	27-Feb-18	MW214	-	207612		0.028			210					620	-2.3	7.8	340		170	1,500			63	67	20	
0083	0083_B05_180616	16-Jun-18	MW214	-	212374		0.043			200					1,100	-4		610		280	2,500			77	95	27	
0083	0083_B05_191128	28-Nov-19	MW214	-	EP1912603	0.06	0.06	0.06	<1	194	<1	194	37.8	39.5	1,030	2.25	8.09	598	233		2,420		2,690	77	105	40	5
0083	0083_MW213_200625	25-Jun-20	MW214	-	EP2006683	0.07	0.07	0.07	<1	208	<1	208	60.4	58.9	1,740	1.3	8.05	933	346		3,670		640	103	142	58	4
0083	0083_MW213_201118	18-Nov-20	MW214	-	EP2012904	0.03	0.03	0.03	<1	176	<1	176	43.6	42.6	1,240	1.14	8.1	647	244		2,480		548	90	108	42	3
0083	0083_MW214_210622	22-Jun-21	MW214	-	EP2107095	0.06	0.06	0.06									8.06				3,410		18				

Table 1 - Groundwater and Seepage Water Results

						PFAS			Inorganics															Metals			Organic
						Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	Sulphate	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
						µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting						0.01	0.001	0.001	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	1	5	1	5	0.1	0.1	0.1	1
PFAS HEPA 2020 - Ecological – 99% species protection																											
0083	0083_B09_180302	02-Mar-18	MW217	-	207818		<0.001			160					26,000	-0.73		15,000		3,500	51,000			570	1,600	500	
0083	0083_B09_180618	16-Jun-18	MW217	-	212374		0.003			190					17,000	-1.8		9,300		2,200	32,000			390	1,000	320	
0083	0083_B09_191128	28-Nov-19	MW217	-	EP1912604	<0.01	<0.01	<0.01	<1	259	<1	259	360	406	11,600	5.97	7.65	6,950	1,340		22,800		309	330	948	361	8
0083	0083_MW217_200626	26-Jun-20	MW217	-	EP2006690	<0.01	<0.01	<0.01	<1	222	<1	222	414	423	13,300	1.12	7.81	7,350	1,640		27,000		178	306	952	382	4
0083	0083_MW217_201118	18-Nov-20	MW217	-	EP2012854	<0.01	<0.01	<0.01	<1	201	<1	201	370	416	12,000	5.8	7.84	7,190	1,340		27,400		16	342	918	417	3
0083	0083_MW217_210622	22-Jun-21	MW217	-	EP2107095	<0.01	<0.01	<0.01	<1	147	<1	147	478	537	15,500	5.78	7.65	9,310	1,840		33,800		226	415	1,190	532	3
0083	0083_B10_180302	02-Mar-18	MW218	-	207818		<0.001			190					8,600	-0.46		4,800		1,200	16,000			190	550	170	
0083	0083_B10_180618	16-Jun-18	MW218	-	212374		0.004			210					7,800	-3.7		4,000		960	14,000			190	460	130	
0083	0083_B10_191128	28-Nov-19	MW218	-	EP1912604	<0.01	<0.01	<0.01	<1	204	<1	204	214	220	6,750	1.44	7.9	3,810	941		12,900		374	184	496	180	4
0083	0083_MW218_200626	26-Jun-20	MW218	-	EP2006690	<0.01	<0.01	<0.01	<1	200	<1	200	191	183	6,060	1.96	7.97	3,170	758		12,000		54	173	400	154	2
0083	0083_MW218_201117	17-Nov-20	MW218	-	EP2012743	<0.01	<0.01	<0.01	<1	190	<1	190	272	261	8,720	2.04	7.93	4,420	1,060		16,200		112	237	614	249	<1
0083	0083_MW218_210622	22-Jun-21	MW218	-	EP2107095	<0.01	<0.01	<0.01	<1	188	<1	188	239	251	7,640	2.32	7.76	4,250	962		18,800		66	245	575	244	3
0083	0083_OTH002_180227	27-Feb-18	OTH002		207612		<0.001			170					26,000	1.7	7.3	15,000		4,200	49,000			610	1,700	540	
0083	0083_OTH002_180606	06-Jun-18	OTH002		212095		<0.001			170					29,000	-4.1		15,000		4,500	51,000			600	1,700	540	
0083	0083_OTH002_201117	17-Nov-20	OTH002		EP2012742	<0.01	<0.01	<0.01	<1	119	<1	119	617	687	19,700	5.36	8.01	11,900	2,830		38,100	4	91	496	1,550	663	
0083	0083_OTH002_210622	22-Jun-21	OTH002		EP2107185	<0.01	<0.01	<0.01	<1	114	<1	114	594	674	19,000	6.3	7.86	11,700	2,700		39,400		42	475	1,520	655	3
0083	0083_OTH101_180212	12-Feb-18	OTH101		206780		0.004			160					21,000	-1.6		11,000		2,600	39,000			400	1,300	380	
0083	0083_OTH101_A_180620	20-Jun-18	OTH101		212571		<0.001			120					16,000	9.8		11,000		2,200	37,000			380	1,300	380	
0083	0083_OTH101_B_180620	20-Jun-18	OTH101		212571		<0.001			120					18,000	8.2		12,000		2,400	37,000			390	1,300	400	
0083	0083_OTH101_191128	28-Nov-19	OTH101		EP1912603	<0.01	<0.01	<0.01	<1	117	<1	117	579	643	18,500	5.2	7.91	11,100	2,650		40,100		16	476	1,460	631	2
0083	0083_OTH101_200628	28-Jun-20	OTH101		EP2006692	<0.01	<0.01	<0.01	<1	120	<1	120	564	656	18,000	7.53	8.11	11,400	2,610		40,200		75	476	1,470	620	2
0083	0083_OTH101_201118	18-Nov-20	OTH101		EP2012854	<0.01	<0.01	<0.01	<1	113	<1	113	600	660	19,200	4.8	8.07	11,500	2,680		41,200		54	467	1,490	546	1
0083	0083_OTH101_210622	22-Jun-21	OTH101		EP2107185	<0.01	<0.01	<0.01	<1	117	<1	117	591	688	18,900	7.57	8.04	11,900	2,670		41,800		47	494	1,560	674	<1
0083	0083_OTH102_180212	12-Feb-18	OTH102		206780					140					21,000	-2		11,000		2,700	39,000			400	1,300	370	
0083	0083_OTH102_A_180620	20-Jun-18	OTH102		212571		<0.001			120					17,000	13		12,000		2,200	38,000			410	1,300	420	
0083	0083_OTH102_B_180620	20-Jun-18	OTH102		212571		<0.001			120					17,000	13		13,000		2,300	37,000			420	1,400	430	
0083	0083_OTH102_191128	28-Nov-19	OTH102		EP1912603	<0.01	<0.01	<0.01	<1	122	<1	122	603	724	19,100	9.14	8.05	12,600	2,960		38,600		32	481	1,640	670	4
0083	0083_OTH002_200627	27-Jun-20	OTH102		EP2006692	<0.01	<0.01	<0.01	<1	132	<1	132	580	668	18,400	7.11	8.07	11,600	2,780		39,700		319	484	1,500	630	2
0083	0083_OTH102_200628	28-Jun-20	OTH102		EP2006692	<0.01	<0.01	<0.01	<1	136	<1	136	579	656	18,500	6.3	8.13	11,400	2,600		41,000		385	476	1,470	623	2
0083	0083_OTH102_201118	18-Nov-20	OTH102		EP2012854	<0.01	<0.01	<0.01	<1	125	<1	125	588	648	18,800	4.83	8	11,300	2,670		42,600		498	455	1,460	539	1
0083	0083_OTH102_210622	22-Jun-21	OTH102		EP2107185	<0.01	<0.01	<0.01	<1	115	<1	115	588	697	18,800	8.47	8.03	12,100	2,680		41,000		60	492	1,570	676	2
0083	0083_OTH103_180212	12-Feb-18	OTH103		206780		0.006			260					21,000	-0.48		12,000		2,700	40,000			410	1,300	390	
0083	0083_OTH103_A_180609	09-Jun-18	OTH103		212095		<0.001			210					20,000	1.3		12,000		2,700	39,000			420	1,300	400	
0083	0083_OTH103_B_180609	09-Jun-18	OTH103		212095		<0.001			150					20,000	1.7		12,000		2,600	36,000			410	1,300	390	
0083	0083_OTH103_191130	30-Nov-19	OTH103		EP1912684	<0.01	<0.01	<0.01	<1	119	<1	119	620	731	19,800	8.23	7.98	12,700	2,820		40,100		346	484	1,660	685	4
0083	0083_OTH103_200627	27-Jun-20	OTH103		EP2006692	<0.01	<0.01	<0.01	<1	128	<1	128	579	678	18,400	7.87	8.11	11,800	2,780		40,800		181	492	1,510	640	2
0083	0083_OTH103_201117	17-Nov-20	OTH103		EP2012742	<0.01	<0.01	<0.01	<1	118	<1	118	617	645	19,700	2.25	8.03	11,200	2,830		38,800	2	43	464	1,450	616	
0083	0083_oth103_210622	22-Jun-21	OTH103		EP2107185	<0.01	<0.01	<0.01	<1	123	<1	123	592	658	18,900	5.34	7.81	11,400	2,700		42,000		184	474	1,490	641	4
0083	0083_OTH104_180212	12-Feb-18	OTH104		206780		<0.001			160					21,000	-1.2		11,000		2,700	39,000			400	1,300	370	
0083	0083_OTH104_A_180609	09-Jun-18	OTH104		212095		<0.001			190					20,000	1		11,000		2,700	39,000			410	1,300	390	
0083	0083_OTH104_B_180609	09-Jun-18	OTH104		212095		<0.001			130					20,000	2.4		12,000		2,600	38,000			420	1,300	400	
0083	0083_OTH104_191128	28-Nov-19	OTH104		EP1912605	<0.01	<0.01	<0.01	<1	123	<1	123	606	707	19,500	7.66	8.09	12,300	2,580		38,900		85	472	1,600	647	2
0083	0083_OTH104_200627	27-Jun-20	OTH104		EP2006692	<0.01	<0.01	<0.01	<1	141	<1	141	568	673	18,000	8.49	8.04	11,700	2,750		39,700		510	492	1,500	638	2
0083	0083_OTH104_201118	18-Nov-20	OTH104		EP2012904	<0.01	<0.01	<0.01	<1	121	<1	121	611	664	19,500	4.18	8.07	11,600	2,810		40,300		136	462	1,490	550	1
0083	0083_OTH104_210622	22-Jun-21	OTH104		EP2107185	<0.01	<0.01	<0.01	<1	119	<1	119	600	664	19,200	5.02	7.99	11,500	2,710		42,100		124	474	1,500	647	<1
0083	0083_OTH105_180221	21-Feb-18	OTH105		207287		<0.001										8.1				41,000						
0083	0083_OTH105_A_180609	09-Jun-18	OTH105		212095		<0.001			120					19,000	1		11,000		2,600	38,000			400	1,300	380	
0083	0083_OTH105_B_180609	09-Jun-18	OTH105		212095		<0.001			120					20,000	1.8		12,000		2,600	39,000			410	1,300	390	
0083	0083_OTH105_191128	28-Nov-19	OTH105		EP1912605	<0.01	<0.01	<0.01	<1	130	<1	130	612	747	19,700	9.9	7.82	13,000	2,600		36,900		66	494	1,690	696	4
0083	0083_OTH105_200627	27-Jun-20	OTH105		EP2006692	<0.01	<0.01	<0.01	<1	132	<1	132	587	639	18,700	4.25	8.05	11,100	2,730		40,100		486	465	1,430	600	2
0083	0083_OTH105_201117	17-Nov-20	OTH105		EP2012742	<0.01	<0.01	<0.01	<1	116	<1	116	619	686	19,800	5.12	8.05	11,900	2,790		38,900		255	496	1,540	649	2
0083	0083_OTH105_210622	22-Jun-21	OTH105		EP2107095	<0.01	<0.01	<0.01	<1	117	<1	117	599	677	19,300	6.14	7.98	11,900	2,490		40,000		44	462	1,490	531	4
0083	0083_OTH106_180221	21-Feb-18	OTH106		207287		0.005										8.1				40,000						
0083	0083_OTH106_A_180609	09-Jun-18	OTH106		212095		<0.001			140					20,000	0.056		11,000		2,700	39,000			410	1,300	390	
0083	0083_OTH106_B_180609	09-Jun-18	OTH106		212095		0.002			120					20,000	-1.4		11,000		2,700	39,000			400	1,200	380	
0083	0083_OTH106_191128	28-Nov-19	OTH106		EP1912605	<0.01	<0.01	<0.01	<1	126	<1	126	603	670	19,300	5.3	8.02	11,600	2,680		38,500		110	494	1,510	652	4
0083	0083_OTH106_200627	27-Jun-20	OTH106		EP2006692	<0.01	<0.01	<0.01	<1	127	<1	127	607	681	19,400	5.72	7.74	11,800	2,750		40,800		196	498	1,530	651	2
0083	0083_OTH106_201117	17-Nov-20	OTH106		EP2012742	<0.01	<0.01	<0.01	<1	116	<1	116	619	686	19,800	5.12	8.09	11,900	2,790		39,000		66	496	1,540	652	2
0083	0083_OTH106_210622	22-Jun-21	OTH106		EP2107095	<0.01	<0.01	<0.01	<1	118	<1	118	583	664	18,800	6.46	8	11,500	2,420		42,400		82	468	1,500	647	3
0083	0083_OTH107_180212	12-Feb-18	OTH107		206780		<0.001			190					21,000	-2		12,000		2,700	40,000			410	1,300	380	
0083	0083_OTH107_A_180623	23-Jun-18	OTH107		212781		<0.001	<0.001		120					20,000	-0.49		11,000		2,800	40,000			400	1,300	390	
0083	0083_OTH107_B_180623	23-Jun-18	OTH107		212781		<0.001	<0.001		120					20,000	5.7		13,000		2,700	41,000			450	1,500	450	
0083	0083_OTH107_191128	28-Nov-19	OTH107		EP1912605	<0.01	<0.01	<0.01	<1	123	<1	123	606	698	19,400	7.13	8.11	12,100	2,680		39,700		43	511	1,570	682	2
0083	0083_OTH107_200627	27-Jun-20	OTH107		EP2006692	<0.01	<0.01	<0.01	<1	130	<1	130	587	697	18,700	8.55	8	12,100	2,750		40,700		368	511	1,560	662	2
0083	0083_OTH107_201117	17-Nov-20	OTH107		EP2012742	<0.01	<0.01	<0.01	<1	116	<1	116	616	680	19,700	5	8.05	11,800	2,770		35,800		166	495	1,530	652	2
0083	0083_OTH107_210622	22-Jun-21	OTH107		EP2107095	<0.01	<0.01	<0.01	<1	129	<1	129	601	687	19,400	6.68	7.73	11,900	2,450		40,600		174	492	1,550	670	5
0083	0083_OTH108_180212	12-Feb-18	OTH108		206780		<0.001			390					21,000	-3.3		11,000		2,600	39,000			390	1,200	360	
0083	0083_OTH108_A_180610	10-Jun-18	OTH108		212095		<0.001			220					20,000	3.5		12,000		2,600	40,000			430	1,300	410	
0083	0083_OTH108_B_180610	10-Jun-18	OTH108		212095		<0.001			170					21,000	2		12,000		2,800	39,000			430	1,400	420	
0083	0083_OTH108_191128	28-Nov-19	OTH108		EP1912605	<0.01	<0.01	<0.01	<1	127	<1	127	610	728	19,500	8.8	8.02	12,700	2,780		38,800		210	479	1,640	667	4
0083	0083_OTH108_200627	27-Jun-20	OTH108		EP2006692	<0.01	<0.01	<0.01	<1	129	<1	129	581	674	18,500	7.46	7.81	11,700	2,700		41,300		372	495	1,510	639	2
0083	0083_OTH108_201117	17-Nov-20	OTH108		EP2012742	<0.01	<0.01	<0.01	<1	154	<1	154	619	662	19,800	3.36	7.9	11,500	2,760		39,000		590	479	1,480	634	4
0083	0083_OTH108_210622	22-Jun-21	OTH108		EP2107095	<0.01	<0.01	<0.01	<1	119	<1	119	616	692	19,900	5.82	7.87	12,000	2,510		39,300		8	491	1,560	676	3
0083	0083_OTH110_A_180620	20-Jun-18	OTH110		212571		0.003			120					17,000	8.5		12,000		2,300	38,000			390	1,300	390	
0083	0083_OTH110_B_180620	20-Jun-18	OTH110		212571		<0.001			120					18,000	6.6		11,000		2,300	38,000			380	1,300	390	
0083	0083_OTH110_191128	28-Nov-19	OTH110		EP1912600	<0.01	<0.01	<0.01	<1	128	<1	128	607	740	19,300	9.92	7.87	12,900	2,870		40,200		105	492	1,670	674	4
0083	0083_OTH110_200626	26-Jun-20	OTH110		EP2006686	<0.01	<0.01	<0.01	<1	124	<1	124	610	665	19,600	4.27	8.13	11,600	2,650		40,700		28	492	1,480	551	3
0083	0083_OTH110_201118	18-Nov-20	OTH110		EP2012904	<0.01	<0.01	<0.01	<1	118	<1	118	602	647	19,200	3.63	8.11	11,300	2,780		39,700		91	452	1,450	537	1
0083	0083_OTH110_210622	22-Jun-21	OTH110		EP2107185	<0.01	<0.01	<0.01	<1	120	<1	120	597	646	19,100	3.97	7.91	11,200	2,680		41,800		31	462	1,460	622	<1
0083	0083_OTH113_A_180610	10-Jun-18	OTH113		212095		0.005			110					20,000	-2.4		11,000		2,600	40,000			380	1,200	370	
0083	0083_OTH113_B_180610	10-Jun-18	OTH113		212095		<0.001			110					20,000	6.9		13,000		2,600	40,000			450	1,400	430	
0083	0083_OTH113_191128	28-Nov-19	OTH113		EP1912600	<0.01	<0.01	<0.01	7	110	<1	117	599	691	19,200	7.15	8.36	12,000	2,650		38,300		<5	466	1,580	630	2
0083	0083_OTH113_200628	28-Jun-20	OTH113		EP2006748	<0.01	<0.01	<0.01	<1	111	<1	111	607	656	19,500	3.88	8.02	11,400	2,650		40,300		<5	476	1,470	619	2
0083	0083_OTH113_201117	17-Nov-20	OTH113		EP2012743	<0.01	<0.01	<0.01	<1	111	<1	111	623	657	20,000	2.62	8.2	11,400	2,720		37,400		33	457	1,480	631	1
0083	0083_OTH113_210622	22-Jun-21	OTH113		EP2107184	0.58	0.56	0.58	<1	113	<1	113	610	681	19,800	5.52	8.06	11,800	2,350		41,100		32	480	1,540	665	2

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Interim Marine 99%
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Table 2 - Surface Water Results

					PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides						
					Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting					0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.002	0.005	0.001	0.05	0.01	0.002	0.001	0.001	0.001	0.001	0.01	0.005	0.002	0.005	0.01	0.002	0.05
PFAS NEMP 2020 Interim Marine 99%									*0.00023*						*19*																	
PFAS NEMP 2020 Recreational Water															**10**																	
Site ID	**Field ID**	**Date**	**Location Code**	**Lab Report Number**																												
0083	**0083_SW112_180228**	**28/02/2018**	**SW112**	**207612**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.004	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_SW112_180608**	**8/06/2018**	**SW112**	**212095**	<0.001	<0.001	<0.001	<0.001	*0.008*	<0.002	<0.002	<0.001	<0.02	<0.001	<0.001	<0.002	<0.05	<0.001	<0.5	<0.1	<0.02	<0.001	<0.001	<0.001	<0.001	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5
0083	**0083_SW112_191128**	**28/11/2019**	**SW112**	**EP1912672**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW112_200526**	**26/05/2020**	**SW112**	**EP2005405**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW112_200625**	**25/06/2020**	**SW112**	**EP2006682**	<0.02	<0.02	<0.02	<0.02	*0.05*	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW112_201118**	**18/11/2020**	**SW112**	**EP2012855**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW112_210305**	**5/03/2021**	**SW112**	**EP2102350**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW112_210622**	**22/06/2021**	**SW112**	**EP2107186**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW113_180301**	**1/03/2018**	**SW113**	**207818**	<0.05	<0.05	1.3	<0.05	*1.1*	<0.1	1.6	4.8	5.5	2.5	0.86	<0.1	<0.2	0.2	<2.5	<0.5	<0.1	<0.05	33	3.3	<0.05	<0.5	<0.2	<0.1	<0.2	<0.5	<0.1	<2.5
0083	**0083_SW113_180604**	**4/06/2018**	**SW113**	**211639**	0.041	0.040	0.50	0.040	*0.81*	<0.002	0.56	1.6	2.1	1.1	0.31	<0.02	<0.005	0.23	<0.05	<0.01	<0.002	<0.001	10	0.66	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_SW113_200526**	**26/05/2020**	**SW113**	**EP2005405**	0.25	<0.02	0.31	<0.02	*0.34*	<0.02	<0.1	1.14	1.81	0.70	0.22	<0.02	<0.02	0.07	<0.05	<0.02	<0.02	<0.05	3.90	0.72	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW113_210305**	**5/03/2021**	**SW113**	**EP2102350**	<0.02	<0.02	0.14	<0.02	*0.21*	<0.02	<0.1	0.54	0.95	0.35	0.12	<0.02	<0.02	0.05	<0.05	<0.02	<0.02	<0.05	1.98	0.43	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW113_210623**	**23/06/2021**	**SW113**	**EP2107191**	<0.02	<0.02	0.03	<0.02	*0.10*	<0.02	<0.1	0.25	0.36	0.16	0.07	<0.02	<0.02	0.02	<0.05	<0.02	<0.02	<0.05	0.84	0.15	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW120_180608**	**8/06/2018**	**SW120**	**212095**	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	<0.002	<0.001	<0.02	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_SW120_200527**	**27/05/2020**	**SW120**	**EP2005486**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW120_210303**	**3/03/2021**	**SW120**	**EP2102201**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW120_210622**	**22/06/2021**	**SW120**	**EP2107186**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW126_180608**	**8/06/2018**	**SW126**	**212095**	<0.001	<0.001	<0.001	<0.001	*0.003*	<0.002	0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_SW127_180606**	**6/06/2018**	**SW127**	**212095**	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_SW127_200526**	**26/05/2020**	**SW127**	**EP2005405**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW127_210303**	**3/03/2021**	**SW127**	**EP2102194**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW127_210622**	**22/06/2021**	**SW127**	**EP2107094**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW128_180604**	**4/06/2018**	**SW128**	**211639**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.053	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05
0083	**0083_SW128_200527**	**27/05/2020**	**SW128**	**EP2005486**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW128_210303**	**3/03/2021**	**SW128**	**EP2102201**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05
0083	**0083_SW128_210622**	**22/06/2021**	**SW128**	**EP2107094**	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05

Environmental Standards

HEPA, January 2020, PFAS NEMP 2020 Interim Marine 99%

HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Note:

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

Table 2 - Surface Water Results

						PFAS															Metals			Organic
					Perfluorobutane sulfonic acid (PFBS)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
					µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting					0.001	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1
PFAS NEMP 2020 Interim Marine 99%																								
PFAS NEMP 2020 Recreational Water							**2**																	
Site ID	**Field ID**	**Date**	**Location Code**	**Lab Report Number**																				
0083	**0083_SW112_180228**	**28/02/2018**	**SW112**	**207612**	<0.001					82					65,000	1.4	8.6	38,000		130,000		1,400	4,300	1,300	
0083	**0083_SW112_180608**	**8/06/2018**	**SW112**	**212095**	<0.001		0.008			54					3,600	0.17		2,000		9,000		430	230	95	
0083	**0083_SW112_191128**	**28/11/2019**	**SW112**	**EP1912672**	<0.02	<0.01	<0.01	<0.01	<1	262	<1	262	4,500	5,490	149,000	9.93	7.5	98,200	14,000	293,000	158	796	12,700	5,290	28
0083	**0083_SW112_200526**	**26/05/2020**	**SW112**	**EP2005405**	<0.02	<0.01	<0.01	<0.01	<1	206	<1	206	958	1,160	29,800	9.53	7.68	19,900	5,440	68,100	8	1,270	2,470	1,080	35
0083	**0083_SW112_200625**	**25/06/2020**	**SW112**	**EP2006682**	<0.02	0.05	0.05	0.05	<1	130	<1	130	1,360	1,520	43,000	5.82	8.22	26,400	6,840	86,900	15	1,520	3,280	1,240	17
0083	**0083_SW112_201118**	**18/11/2020**	**SW112**	**EP2012855**	<0.02	<0.01	<0.01	<0.01	<1	201	<1	201	3,230	3,960	105,000	10.2	7.7	70,200	12,600	236,000	986	1,020	9,150	4,130	42
0083	**0083_SW112_210305**	**5/03/2021**	**SW112**	**EP2102350**	<0.02	<0.01	<0.01	<0.01	<1	90	<1	90	314	308	9,330	1	7.33	5,120	2,380	18,800	8	685	534	291	33
0083	**0083_SW112_210622**	**22/06/2021**	**SW112**	**EP2107186**	<0.02	<0.01	<0.01	<0.01	<1	181	<1	181	832	962	26,200	7.23	8	16,400	4,310	58,800	42	1,150	2,060	858	14
0083	**0083_SW113_180301**	**1/03/2018**	**SW113**	**207818**	<0.05		**2.4**			300					1,000	3.2		580		4,400		490	54	27	
0083	**0083_SW113_180604**	**4/06/2018**	**SW113**	**211639**	0.041		1.3			97					170	4.3		120		1,100		120	13	7	
0083	**0083_SW113_200526**	**26/05/2020**	**SW113**	**EP2005405**	0.25	9.39	0.65	9.46	<1	78	<1	78	15.8	17	278	3.65	7.08	171	309	1,220	9	157	18	11	142
0083	**0083_SW113_210305**	**5/03/2021**	**SW113**	**EP2102350**	<0.02	4.72	0.35	4.77	<1	53	<1	53	5.98	6.32	108	2.79	7.4	76	90	352	<5	48	6	5	51
0083	**0083_SW113_210623**	**23/06/2021**	**SW113**	**EP2107191**	<0.02	1.96	0.13	1.98	<1	80	<1	80	4.8	4.99	72	1.98	7.84	53	56	379	<5	44	5	3	55
0083	**0083_SW120_180608**	**8/06/2018**	**SW120**	**212095**	<0.001		0.002			42					2,800	3.6		1,700		6,500		270	180	66	
0083	**0083_SW120_200527**	**27/05/2020**	**SW120**	**EP2005486**	<0.02	<0.01	<0.01	<0.01	<1	154	<1	154	949	1,000	29,800	2.83	7.77	17,200	5,080	62,800	6	1,190	2,120	891	19
0083	**0083_SW120_210303**	**3/03/2021**	**SW120**	**EP2102201**	<0.02	<0.01	<0.01	<0.01	<1	68	<1	68	201	192	6,080	2.3	7.37	3,170	1,350	12,000	8	421	345	182	17
0083	**0083_SW120_210622**	**22/06/2021**	**SW120**	**EP2107186**	<0.02	<0.01	<0.01	<0.01	<1	69	<1	69	297	294	8,670	0.46	7.74	4,470	2,450	19,700	133	965	551	247	16
0083	**0083_SW126_180608**	**8/06/2018**	**SW126**	**212095**	<0.001		0.003			110					1,600	2.1		980		4,600		360	99	43	
0083	**0083_SW127_180606**	**6/06/2018**	**SW127**	**212095**	<0.001		0.002			57					1,000	2.1		630		3,100		220	80	33	
0083	**0083_SW127_200526**	**26/05/2020**	**SW127**	**EP2005405**	<0.02	<0.01	<0.01	<0.01	<1	78	<1	78	514	581	15,500	6.03	7.62	10,000	3,640	34,000	14	1,190	889	512	20
0083	**0083_SW127_210303**	**3/03/2021**	**SW127**	**EP2102194**	<0.02	<0.01	<0.01	<0.01	<1	60	<1	60	156	151	4,170	1.72	7.49	2,340	1,800	9,740	13	558	220	129	17
0083	**0083_SW127_210622**	**22/06/2021**	**SW127**	**EP2107094**	<0.02	<0.01	<0.01	<0.01	<1	108	<1	108	245	228	6,800	3.64	7.82	3,250	2,460	16,800	15	882	459	188	13
0083	**0083_SW128_180604**	**4/06/2018**	**SW128**	**211639**	<0.001		<0.001			140					79,000	3.7		51,000		160,000		1,500	4,500	1,300	
0083	**0083_SW128_200527**	**27/05/2020**	**SW128**	**EP2005486**	<0.02	<0.01	<0.01	<0.01	<1	94	<1	94	667	799	20,500	8.96	7.85	13,900	4,190	43,300	<5	1,120	1,490	613	19
0083	**0083_SW128_210303**	**3/03/2021**	**SW128**	**EP2102201**	<0.02	<0.01	<0.01	<0.01	<1	50	<1	50	202	191	5,860	2.83	7.75	3,020	1,720	12,100	22	494	380	145	7
0083	**0083_SW128_210622**	**22/06/2021**	**SW128**	**EP2107094**	<0.02	<0.01	<0.01	<0.01	<1	59	<1	59	142	148	3,860	1.95	7.69	2,080	1,550	10,000	12	589	305	118	6

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Interim Marine 99%
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Table 3 - Sediment Results

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides							PFAS										Organic
	3perfluorobutane sulfonic acid (PFBS)	3perfluoropentane sulfonic acid (PFPeS)	3perfluorohexane sulfonic acid (PFHxS)	3perfluoroheptane sulfonic acid (PFHpS)	3perfluorooctane sulfonic acid (PFOS)	3perfluorodecane sulfonic acid (PFDS)	2perfluorobutanoic acid (PFBA)	2perfluorohexanoic acid (PFHxA)	2perfluoropentanoic acid (PFPeA)	2perfluoroheptanoic acid (PFHpA)	3perfluorooctanoic acid (PFOA)	2perfluorononanoic acid (PFNA)	2perfluorodecanoic acid (PFDA)	2perfluoroundecanoic acid (PFUnDA)	2perfluorododecanoic acid (PFDoDA)	2perfluorotridecanoic acid (PFTrDA)	2perfluorotetradecanoic acid (PFTeDA)	3:3 Fluorotelomer sulfonic acid (4:2 FTS)	3:3 Fluorotelomer sulfonic acid (6:2 FTS)	3:3 Fluorotelomer sulfonic acid (8:2 FTS)	3:3 Fluorotelomer sulfonic acid (10:2 FTS)	3perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER list)	Sum of PFHxS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	% Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity (1lab)	pH (Lab)	Organic Matter
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%
LOR - Limit of Reporting	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5
PFAS NEMP 2020 Ecological direct exposure					*1*						*10*																											
PFAS NEMP 2020 Ecological indirect exposure					0.01																																	
PFAS NEMP 2020 Industrial/ commercial (HIL D)											**50**																				**20**								
Site ID	**Field ID**	**Date**	**Location Code**	**Lab Report Number**																																			
0083	**0083_SD112_200526**	**26/05/2020**	**SD112**	**EP2005404**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.6	25.2	23.0	3.2	0.1	0.4	26.8	11,500	8.7	1.4
0083	**0083_SD112_0.00-0.10_200625**	**25/06/2020**	**SD112**	**EP2006684**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	3.5	54.7	50.4	6.6	0.4	2.1	59.6	17,600	8.4	6.9
0083	**0083_SD112_0.00-0.10_201118**	**18/11/2020**	**SD112**	**EP2012856**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.3	26.2	18.4	2.0	<0.1	0.3	20.7	12,200	8.3	1.3
0083	**0083_SD112_210305**	**5/03/2021**	**SD112**	**EP2102349**	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.0003	0.0003	0.0003	3.3	40.2	71.4	8.5	0.9	2.7	83.6	9,840	9.0	3.2
0083	**0083_SD112_210622**	**22/06/2021**	**SD112**	**EP2107187**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.3	27.1	22.4	6.3	0.2	0.7	29.7	5,040	8.8	3.8
0083	**0083_SD113_200526**	**26/05/2020**	**SD113**	**EP2005404**	<0.0002	<0.0002	0.0011	<0.0002	0.0082	<0.0002	<0.001	0.0016	0.0018	0.0120	0.0007	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0590	0.0517	0.0006	0.0004	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.136	0.0093	0.137	3.2	17.0	13.0	1.6	0.1	0.5	15.2	154	8.3	17.7
0083	**0083_SD113_0.00-0.10_200625**	**25/06/2020**	**SD113**	**EP2006684**	<0.0002	<0.0002	0.0005	<0.0002	0.0020	<0.0002	<0.001	0.0016	0.0023	0.0008	0.0003	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0005	0.0153	0.0128	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.0356	0.0025	0.0358	0.5	1.1	15.8	0.8	<0.1	<0.1	16.8	409	8.1	8.7
0083	**0083_SD113_201118**	**18/11/2020**	**SD113**	**EP2012801**	**0.0004**	<0.0002	0.0012	<0.0002	0.0073	<0.0002	<0.001	0.0020	0.0032	0.0009	0.0009	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0005	0.0200	0.0152	<0.0005	**0.0003**	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.0511	0.0085	0.0518	0.7	4.9	22.7	2.2	0.1	0.2	25.1	391	7.6	9.7
0083	**0083_SD113_210305**	**5/03/2021**	**SD113**	**EP2102349**	<0.0002	<0.0002	0.0002	<0.0002	0.0009	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0012	0.0016	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.0039	0.0011	0.0039	1.4	6.4	19.4	1.6	<0.1	0.3	21.4	78	8.0	4.1
0083	**0083_SD113_210623**	**23/06/2021**	**SD113**	**EP2107192**	<0.0002	<0.0002	<0.0002	<0.0002	0.0013	<0.0002	<0.001	0.0002	0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0022	0.0044	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.0086	0.0013	0.0086	0.8	12.6	19.0	1.8	0.1	0.2	21.1	93	8.2	10.8
0083	**0083_SD120_0.0_180608**	**8/06/2018**	**SD120**	**212095**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.005	<0.0001	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.0002						22	61	6.6	0.9	4.1	72		
0083	**0083_SD120_0.4_180608**	**8/06/2018**	**SD120**	**212095**	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0005	<0.0001	<0.005	<0.0001	<0.005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.001	<0.0002						28	6.0	6.3	1.9	4.8	19		
0083	**0083_SD120_200527**	**27/05/2020**	**SD120**	**EP2005480**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	3.1	49.0	34.7	6.2	0.2	1.3	42.5	11,600	8.6	4.3
0083	**0083_SD120_0.00-0.10_200626**	**26/06/2020**	**SD120**	**EP2006689**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.7	22.0	129	10.5	0.7	3.9	144	22,300	8.7	2.3
0083	**0083_SD120_0.00-0.10_201118**	**18/11/2020**	**SD120**	**EP2012856**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.7	13.7	38.1	7.4	0.3	0.8	46.6	20,200	8.8	1.7
0083	**0083_SD120_210303**	**3/03/2021**	**SD120**	**EP2102202**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	25.0	38.8	4.1	0.2	0.3	43.4	5,470	8.4	0.9
0083	**0083_SD120_210622**	**22/06/2021**	**SD120**	**EP2107187**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	6.9	61.9	23.1	10.8	0.8	2.6	37.4	8,990	8.3	11.0
0083	**0083_SD126_200527**	**27/05/2020**	**SD126**	**EP2005480**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.7	29.2	140	7.6	0.4	1.1	149	12,800	8.8	3.2
0083	**0083_SD126_200623**	**23/06/2020**	**SD126**	**EP2006452**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.1	18.4	23.7	8.9	0.7	0.7	34.0	18,700	8.7	1.5
0083	**0083_SD126_201117**	**17/11/2020**	**SD126**	**EP2012744**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.7	0.4	61.2	3.6	0.1	0.5	65.5	12,400	9.4	2.0
0083	**0083_SD126_210303**	**3/03/2021**	**SD126**	**EP2102349**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.3	18.8	20.3	4.0	0.1	<0.1	24.6	2,220	8.9	0.6
0083	**0083_SD126_210622**	**22/06/2021**	**SD126**	**EP2107187**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.4	21.5	40.0	2.5	0.2	0.2	42.9	3,880	8.4	2.4
0083	**0083_SD127_191128**	**28/11/2019**	**SD127**	**EP1912608**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.2	29.3	17.7	2.1	<0.1	0.2	20.0	3,330	8.8	2.0
0083	**0083_SD127_200526**	**26/05/2020**	**SD127**	**EP2005404**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.5	17.7	20.5	4.5	<0.1	0.4	25.4	4,780	9.2	1.0
0083	**0083_SD127_200623**	**23/06/2020**	**SD127**	**EP2006452**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.2	24.0	127	1.6	<0.1	0.3	128	3,630	8.8	0.5
0083	**0083_SD127_201117**	**17/11/2020**	**SD127**	**EP2012741**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.7	6.5	34.3	1.3	<0.1	0.2	35.9	9,500	9.0	1.2
0083	**0083_SD127_210303**	**3/03/2021**	**SD127**	**EP2102349**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.4	20.6	63.0	4.9	0.1	0.3	68.3	9,400	9.0	<0.5
0083	**0083_SD127_210622**	**22/06/2021**	**SD127**	**EP2107093**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.4	31.4	59.5	2.1	<0.1	0.3	61.9	3,350	8.4	3.7
0083	**0083_SD128_191128**	**28/11/2019**	**SD128**	**EP1912608**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.6	21.1	79.1	2.6	0.2	0.5	82.3	9,970	8.5	0.7
0083	**0083_SD128_200527**	**27/05/2020**	**SD128**	**EP2005480**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	27.0	63.8	5.2	0.1	0.6	69.6	5,000	9.4	1.2
0083	**0083_SD128_200623**	**23/06/2020**	**SD128**	**EP2006452**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	21.2	114	6.1	0.2	1.0	121	18,700	8.6	2.1
0083	**0083_SD128_201117**	**17/11/2020**	**SD128**	**EP2012741**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.4	9.3	54.7	6.1	0.1	0.9	61.8	26,400	9.3	1.8
0083	**0083_SD128_210303**	**3/03/2021**	**SD128**	**EP2102202**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	17.3	49.9	4.8	<0.1	0.5	55.2	4,610	8.9	0.9
0083	**0083_SD128_210622**	**22/06/2021**	**SD128**	**EP2107093**	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	18.2	23.0	2.8	<0.1	0.2	26.0	1,800	8.6	2.6

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Ecological indirect exposure
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Monitoring Date	Monitoring Location	Sample_ID	Other Observations on Bore/Site	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour Comments	Colour
26/06/2020	MW003	0083_MW003_200626		26.8	1.29	27566		7.41	-143.2		Clear
17/11/2020	MW003	0083_MW003_201117		29.4	1.16	28147	16867.5	6.21	-18.8	no	Clear
22/06/2021	MW003	0083_MW003_210622		25.6	2.05	30232	19652.2	7.6	-14.8	Hydrocarbon	Clear
30/11/2019	MW008	0083_MW8_191130		30.5		1397.5	3932	7.89	7.17		
26/06/2020	MW008	0083_MW008_200626		26.1	1.29	17516		7.39	-136.2	petrol smell	Green,Cloudy
17/11/2020	MW008	0083_MW008_201117		30.7	1.52	35426	20728.5	5.8	21.2	no	Clear
22/06/2021	MW008	0083_MW008_210622		26.1	1.11	31499	20475	7.62	-69.8	Slight hydrocarbon	Clear
25/06/2020	MW017	0083_MW017_200625		29.1	1.52	25362		7.24	-187		Cloudy,Clear
18/11/2020	MW017	0083_MW017_201118		27	2.05	23984	15008.5	7.38	-153.7	no	Clear
22/06/2021	MW017	0083_MW017_210622		27.3	1.82	16215	10543	7.48	7.8		Clear
25/06/2020	MW019	0083_MW019_200625		26	1.04	24557		7.11	-99.1		Clear,Cloudy
18/11/2020	MW019	0083_MW019_201118		26.5	0.85	31502	19935.5	6.9	-126.3	no	Brown
23/06/2021	MW019	0083_MW019_210623		25.3	1.89	21372	13884	7.27	-57.2		Cloudy
28/11/2019	MW027	0083_MW27_191128	No cap on pvc - QC101/201	28.8	4.58	16884	10991.5	7.37	4.9		Clear
25/06/2020	MW027	0083_MW027_200625		26.2	1.3	24953		7.13	-47.4		Clear
18/11/2020	MW027	0083_MW027_201118		28	1.01	28811	17719	7.14	-116.9	no	Clear
23/06/2021	MW027	0083_MW027_210623	Dead ants in sleeve.	24	0.83	26933	17576	6.62	-228.8		Clear
28/11/2019	MW101		missing coordinates								
25/06/2020	MW101	0083_MW101_200625		30.8	0.59	27221		7.16	-218.4	petrol smell	Cloudy,Green
18/11/2020	MW101	0083_MW101_201118		28.7	4.09	27325	16763.5	7.11	-156.9	no	Brown
23/06/2021	MW101	0083_MW101_210623	Not enough water for DOC sample	24.6	0.98	12612	8196.5	7.38	-263.4	Sulfur	Cloudy,Black
28/11/2019	MW102		missing coordinates								
25/06/2020	MW102	0083_MW102_200625		27.8	0.66	27697		7.17	-159.7	Mild	Clear
18/11/2020	MW102	0083_MW102_201118		28.1	0.81	26164	16074.5	7.11	-93.2	no	Brown
22/06/2021	MW102	0083_MW102_210622		26.5	1.99	7129	4634.5	7.84	74.5		Clear,Cloudy
28/11/2019	MW103	0083_MW103_191128	QC102/202	28.2	2.79	12896	8378.5	7.57	-32.9		Cloudy
25/06/2020	MW103	0083_MW103_200625		27.1	1.07	19519		7.26	-82.7		Clear
18/11/2020	MW103	0083_MW103_201118		28.8	1.27	24780	15002	7.22	-118	no	Black
22/06/2021	MW103	0083_MW103_210622		25.6	1.44	15212	9886.5	7.48	70.7		Clear,Brown
28/11/2019	MW104	0083_MW104_5.5-6.0_191128		28.5	2.53	13371	8690.5	7.62	-39.9		Clear
25/06/2020	MW104	0083_MW104_200625		29	1.79	15518		7.4	-182.1		Clear
18/11/2020	MW104	0083_MW104_201118		27.8	1.75	17742	10952	7.62	27	no	Clear
22/06/2021	MW104	0083_MW104_5.5-6_210622		22.8	2.37	18136	11791	7.74	46.7		Cloudy
28/11/2019	MW105	0083_MW105_4.0191128		29.1	3.94	31389	8856.5	7.4	15.4		Clear
26/06/2020	MW105	0083_MW105_200626		27.8	1.98	28761		7.37	-131.7		Clear,Cloudy
17/11/2020	MW105	0083_MW105_201117		33.6	0.79	42161	23549	7.42	-119.8	no	Clear
22/06/2021	MW105	0083_MW105_210622		27.5	2.54	15597	10140	7.53	-68		Clear,Cloudy
30/11/2019	MW107		DRY - Not Sampled								
30/11/2019	MW107	0083_MW107_5.5-6.0_191130		29.1	3.2	56570	43125	7.57	-406.3		
26/06/2020	MW107	0083_MW107_200626		26.5	1.58	54126	34190	7.44	42.9		Clear
17/11/2020	MW107	0083_MW107_201117		30.3	1.52	55033		7.5	-2	no	Clear
22/06/2021	MW107	0083_MW107_3.1-4.1_210622		20.3	4.06	52872	34385	7.56	14.7		Cloudy
30/11/2019	MW109	0083_MW109_7.5-8.0_191130		29.7	2.25	59279	35425	7.57	-411		
27/06/2020	MW109	0083_MW109_200627		25.8	4.01	53797	34450	7.51	-34.1		Clear
18/11/2020	MW109	0083_MW109_201118		28.4	3.09	62657		7.69	-61.7	no	Clear
22/06/2021	MW109	0083_MW109_9.3-9.8_210622		23	3.69	53084	34515	7.57	74.8		Clear
28/11/2019	MW110		Dry								
26/06/2020	MW110	0083_MW110_200626		27.6	3.07	51376		7.42	-74.6		Clear
18/11/2020	MW110	0083_MW110_201118		29.1	2.1	61560	37115	7.59	-108.1	no	Clear
22/06/2021	MW110	0083_MW110_9-9.5_210622		22.3	3.01	31422	20423	7.67	-28.4		Clear
28/11/2019	MW111	0083_MW111_8.5-9.0_191128		29.7	5.6	21874	4196	7.58	-54		Cloudy
26/06/2020	MW111	0083_MW111_200626	Dry								
18/11/2020	MW111	0083_MW111_201118		28.9	1.76	57640	34905	7.65	-226.6	no	Clear
22/06/2021	MW111	0083_MW111_10.5-11_210622		21.3	0.55	53150	34554	7.78	-313.6		Cloudy
28/11/2019	MW112		DRY - Not Sampled								
28/11/2019	MW112	0083_MW112_4.5-5.0_191128	Sample labelled MW122 in ALS COA	28.4	1.51	55973	24125	7.5	-7.5		Cloudy,Brown
26/06/2020	MW112	0083_MW112_200626		27.5	1.68	51703		7.5	-174.9		Clear,Cloudy
18/11/2020	MW112	0083_MW112_201118		27.3	1.96	59319	36920	4.57	244.2	no	Clear
22/06/2021	MW112	0083_MW112_4.5-5_210622		20.6	4.43	53824	34989.5	7.68	89.4		

Monitoring Date	Monitoring Location	Sample_ID	Other Observations on Bore/Site	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour Comments	Colour
28/11/2019	MW113	0083_MW113_2.5-3.5_191128		30.5	9.91	1333		7.22	1058		
25/06/2020	MW113	0083_MW113_200625		25.4	2.92	53514	34515	7.82	-6.3		Cloudy
18/11/2020	MW113	0083_MW113_201118		28.5	1.03	584		7.72	172.3	no	Clear
22/06/2021	MW113	0083_MW113_2.5-3.5_210622		25.7	4.27	29895	19422	7.67	135.3		Cloudy
28/11/2019	MW114	0083_MW114_2.0-3.0_191128		30.3	8.83	4800		7.52	1070		
25/06/2020	MW114	0083_MW114_200625		25.1	1	54412	35295	7.82	-112.6		Cloudy
18/11/2020	MW114	0083_MW114_201118		28.3	2.18	54934		7.61	138	no	Clear
22/06/2021	MW114	0083_MW114_2-3_210622		27.2	5.38	30347	19727	7.81	133.5		Cloudy
28/11/2019	MW115	0083_MW115_2.0-3.0_191128	QC104/204 taken	27.5	2.02	26039		7.46	28.1		
25/06/2020	MW115	0083_MW115_200625		24.6	2.07	51870	33995	7.73	31.3		Cloudy
18/11/2020	MW115	0083_MW115_201118		28.7	1.35	64480		7.57	156.8	no	Clear
22/06/2021	MW115	0083_MW115_8.5-9_210622		23.8	4.73	42122	27371	7.88	130.5		Cloudy
28/11/2019	MW116	0083_MW116_4.5-5.0_191128		24.8	7.1			7.54			
25/06/2020	MW116	0083_MW116_200625		21.9	2.92	50898	35230	7.91	40.8		Clear
18/11/2020	MW116		bore locked							no	Clear
22/06/2021	MW116	0083_MW116_4.5-5_210622		24.6	4.37	36072	23543	7.86	146.9		Clear
28/11/2019	MW117	0083_MW117_4-4.5_191128		23.8	6.43	1468		7.9	32.2		
23/06/2020	MW117	0083_MW117_200623		28.2	2.74	53907		7.45	-88.9		Cloudy,Brown
17/11/2020	MW117	0083_MW117_201117		28.7	4.1	54013		7.73	191.2	no	Clear
22/06/2021	MW117	0083_MW117_6-6.5_210622		24.1	3.22	38020	24771	7.72	139.9		Clear
28/11/2019	MW118	0083_MW118_191128		28.2	2.83	7077	8369	7.54	-36.9		Cloudy
28/11/2019	MW119	0083_MW119_191128		28.6	2.87	17077	1102	7.51	-39.3		Cloudy
25/06/2020	MW119	0083_MW119_200625		27.4	1.64	23063		7.35	-110		Clear
17/11/2020	MW119	0083_MW119_201117		2.4	1.95	98983	17368	8.34	-94.8	no	Clear
23/06/2021	MW119	0083_MW119_210623		25.2	1.53	27112	17634	7.63	-117.1		Clear
28/11/2019	MW123	0083_MW123_191128		28.9	1.8	34262	20735	7.2	157		
25/06/2020	MW123	0083_MW123_200625		27.6	0.94	59337		7.13	-107.8		Cloudy,Brown
18/11/2020	MW123	0083_MW123_201118		28.1	0.86	81271	49855	7.22	-80.5	no	Clear
22/06/2021	MW123		Access denied to the antenna field due to Base activities. Not sampled								
28/11/2019	MW129		DRY - Not Sampled								
28/11/2019	MW129	0083_MW129_5.5-6.0_191128	QC103/203	27.2	4.17	47120	29438.5	7.68	45.6		Clear,Cloudy
23/06/2020	MW129	0083_ MW129_200623		27.3	3.55	44189		7.45	-13.9		Clear
17/11/2020	MW129	0083_MW129_201117		29.4	1.1	53939	32370	6.93	-106.8	no	Brown
22/06/2021	MW129	0083_MW129_210622		23.2	1.73	26907	17408	7.33	57.8		Cloudy,Black
28/11/2019	MW130	0083_MW130_3.4-3.9_191128		27.4	2	51288	21850	7.22	-107.5		Clear
23/06/2020	MW130	0083_MW130_200623		25.1	1.69	49022	31811	7.47	17.1		Cloudy
17/11/2020	MW130	0083_MW130_201117		28.2	2.61	50748	31005	7.22	4.5	no	Brown
22/06/2021	MW130	0083_MW130_210622	Missing cap on well	21.9	3.5	31585	20533	7.32	105.3		Cloudy
28/11/2019	MW134	0083_MW134_191128		29.8	1.76	45162	26871	7.34	-32.7		Cloudy,Brown
23/06/2020	MW134	0083_MW134_200623		27.1	2.1	41773	26159	7.4	120.5		Clear
17/11/2020	MW134	0083_MW134_201117		27.4	1.86	41465	25740	7.12	41.8	no	Cloudy
22/06/2021	MW134	0083_MW134_210622		22.4	1.38	43477	28262	7.41	63.3		Clear
28/11/2019	MW17	0083_MW17_191128		27.7	3.12	18261	1875.5	7.36	-33.6		Clear
28/11/2019	MW19		missing coordinates								
28/11/2019	MW202	0083_AB20_191128		30.2	3.06	20936	3643.5	7.4	-167	Sulphur	Clear
26/06/2020	MW202	0083_MW202_200626		27.5	2.41	43602		7.36	-133.6		Clear
18/11/2020	MW202	0083_MW202_201118		28.6	1.08	47777		7.7	-136.6	no	Clear
22/06/2021	MW202	0083_MW202_210622		24.4	4.8	27869	18109	7.72	116.6		Black
28/11/2019	MW210	0083_B02_191128	Dipper not working	28.5	3.51	25060	5249	7.37	12.5		Clear
26/06/2020	MW210	0083_MW210_200626		27.3	1.5	23993		7.36	-112.4		Clear
17/11/2020	MW210	0083_MW210_201117		29.2	1.52	30426	18310.5	7.9	-73.7	no	Clear
22/06/2021	MW210	0083_MW210_210622		26.9	0.78	27551	17907.5	7.44	20.7		Clear
28/11/2019	MW212	0083_B04_191128		30	4.45	28179	6685	7.53	25.5		Clear
26/06/2020	MW212	0083_MW212_200626		27.9	1.71	26845		7.42	-109.5		Clear
17/11/2020	MW212	0083_MW212_201117		30	1.71	37518	22139	7.33	14.9	no	Clear
22/06/2021	MW212	0083_MW212_210622		26.5	0.87	28374	18447	7.52	53.1		Clear
28/11/2019	MW213	0083_BDDB05_191128		28	3.81	4292	2775	7.82	-48		Clear
25/06/2020	MW213	0083_MW213_200625		28.2	2.56	6261		7.62	-185.8		Clear,Green,Cloudy
18/11/2020	MW213		Dry							no	Clear
23/06/2021	MW213	0083_MW213_210623	Not enough water for DOC sample	23.6	2.1	5367	3490.5	7.35	-51.3		Clear
28/11/2019	MW214	0083_B05_191128		27.9	2.97	4584	2977	8.02	-48		Cloudy

Monitoring Date	Monitoring Location	Sample_ID	Other Observations on Bore/Site	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour	Comments	Colour
18/11/2020	MW214	0083_MW213_201118	Water level shallow. Sampled with bailer	27.3	3.19	9389	5850	8.12	38.3	no		Clear
22/06/2021	MW214	0083_MW214_210622	Not enough water to fill all sampling bottles	25.2	3.9	5867	3809	8.25	103.1			Clear
28/11/2019	MW217	0083_B09_191128		27.8	7.8	1104		7.4	28.7			
26/06/2020	MW217	0083_MW217_200626		27.6	2.15	39145	24303.5	7.45	47.6			Clear
18/11/2020	MW217	0083_MW217_201118		25.5	2.3	37920		7.67	127.2	no		Clear
22/06/2021	MW217	0083_MW217_210622		24.4	3.58	43182	28086.5	7.62	136.8			Clear
28/11/2019	MW218	0083_B10_191128		37.6	7.46	1103		7.72	155			
26/06/2020	MW218	0083_MW218_200626		27.4	3.49	23708	14729.5	7.65	14.4			Cloudy
17/11/2020	MW218	0083_MW218_201117		27.4	3.53	29933	18583.5	7.39	-24	no		Clear
22/06/2021	MW218	0083_MW218_210622		25.6	4.39	10748	6987.5	7.86	119.4			Clear
25/06/2020	MW219		Well dry									
28/11/2019	OTH002		Not sampled - not flowing									
27/06/2020	OTH002	0083_OTH002_200627		24.5	4.82	54000	35100	8.19	54			Clear
17/11/2020	OTH002	0083_OTH002_201117		28.6	4.17	55836		8.13	82.4	no		Clear
22/06/2021	OTH002	0083_OTH002_210622	Qc103/203	21.4	4.63	54620	35490	7.87	47.2			Clear
28/11/2019	OTH101	0083_OTH101_191128		29.4	5.24	23998	5593.5	7.88	-53.9			
27/06/2020	OTH101	0083_OTH101_200627		24.4	4.94	53222	34580	8.18	52.6			Clear
18/11/2020	OTH101	0083_OTH101_201118		29.1	4.67	63065	37960	8.15	2.7	no		Clear
22/06/2021	OTH101	0083_OTH101_210622		21.6	5.05	29512	19246	8.1	-62.9			Clear
28/11/2019	OTH102	0083_OTH102_191128		28.8	5.46	23737	5411.5	8.08	-48.8			
28/06/2020	OTH102	0083_OTH102_200628		24.5	5	53630	34840	8.23	52.9			Clear
18/11/2020	OTH102	0083_OTH102_201118		27.5	4.3	61330		8.21	7.3	no		Clear
22/06/2021	OTH102	0083_OTH102_210622		22.3	4.07	54611	35490	8.08	-163.5			Clear
27/06/2020	OTH103	0083_OTH103_200627		23.9	5.27	53807	34905	8.2	54			Clear
17/11/2020	OTH103	0083_OTH103_201117		28.4	4.84	29130		8.21	94.2	no		Clear
22/06/2021	OTH103	0083_OTH103_210622		19.4	5.37	54942	35711	7.97	60.7			Clear
28/11/2019	OTH104	0083_OTH104_191128		29.4	3.77	59053	35425	8.05	-395.8			
27/06/2020	OTH104	0083_OTH104_200627		24.7	5.11	54104	35156	8.18	56.1			Clear
18/11/2020	OTH104	0083_OTH104_201118		26.3	1.49	60892	38545	7.88	93.1	no		Clear
22/06/2021	OTH104	0083_OTH104_210622		21.6	4.85	55187	35880	8.05	117.1			Clear
28/11/2019	OTH105	0083_OTH105_191128		30.6	6.15	60226	35555	7.94	-47.8			
27/06/2020	OTH105	0083_OTH105_200627		24.2	12.38	53852	34970	8.19	55.3			Clear
17/11/2020	OTH105	0083_OTH105_201117		28.6	5.34	54876		8.18	167.6	no		Clear
22/06/2021	OTH105	0083_OTH105_210622		22.1	4.72	55423	36010	8.05	127.2			Clear
28/11/2019	OTH106	0083_OTH106_191128		32.9	3.15	62938	35555	7.96	-337.1			
27/06/2020	OTH106	0083_OTH106_200627		24.6	4.97	54272	35295	8.1	54.7			Clear
17/11/2020	OTH106	0083_OTH106_201117		28	4.27	8.19		8.19	170.4	no		Clear
22/06/2021	OTH106	0083_OTH106_210622		19.3	5.78	28920	18798	8.09	133.1			Clear
28/11/2019	OTH107	0083_OTH107_191128		32.2	2.77	61951	35360	7.05	-364.2			
27/06/2020	OTH107	0083_OTH107_200627		24.1	6.6	54195	35230	8.13	51.9			Clear
17/11/2020	OTH107	0083_OTH107_201117		28.4	4.28	55681		8.18	186.7	no		Clear
22/06/2021	OTH107	0083_OTH107_210622		18.4	6.13	55382	35990.5	8.05	132.6			Clear
28/11/2019	OTH108	0083_OTH108_191128		33.8	3.9	64330	35425	6.43	86			
27/06/2020	OTH108	0083_OTH108_200627										Clear
17/11/2020	OTH108	0083_OTH108_201117		30.4	3.66	55493		8.13	190.3	no		Clear
22/06/2021	OTH108	0083_OTH108_210622		17.4	6.04	36420	23699	7.99	136.3			Clear
28/11/2019	OTH109	0083_OTH109_191128		27.9	4.79	58036	25750	8.03	12.5			Clear
26/06/2020	OTH109	0083_OTH109_200626		27.3	4.01	53044		8.09	-154.1			Clear
18/11/2020	OTH109	0083_OTH109_201118		28.5	3.73	62615	38025	8.22	-15.9	no		Clear
22/06/2021	OTH109	0083_OTH109_210622		24.1	4.22	51999	33800	7.99	116.7			Clear
28/11/2019	OTH110	0083_OTH110_191128		31.1	2.76	61428	25950	8.04	17.3			Clear
26/06/2020	OTH110	0083_OTH110_200626		27.6	3.68	53620		8.11	-110.5			Clear
18/11/2020	OTH110	0083_OTH110_201118		28.4	1.1	61587	37635	8.21	7.1	no		Clear
22/06/2021	OTH110	0083_OTH110_210622		22.9	4.58	54161	35230	8	88.5			Clear
28/11/2019	OTH113	0083_OTH113_191128		27.6	4.49	57149	25425	8.42	35.8			Clear
28/06/2020	OTH113	0083_OTH113_200628		24.7	4.69	52667	34450	8.17	59.1			Clear
17/11/2020	OTH113	0083_OTH113_201117		26.6	4.35	55753	35230	7.86	50	no		Clear
22/06/2021	OTH113	0083_OTH113_210622		20.8	3.99	54859	35685	8.1	94.9			Clear
28/11/2019	SW112	0083_SW112_191128	Sample taken 100m to ESE of GPS point	37.4	0.39	279596	37030	7.25	172.6			Clear
26/05/2020	SW112	0083_SW112_200526		22.9	3.49	83592	56615	8.07	165.5			Yellow
25/06/2020	SW112	0083_SW112_200625	QC101, QC201	25.9	2.49	106531		8.13	-119.1			Clear

Monitoring Date	Monitoring Location	Sample_ID	Other Observations on Bore/Site	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour Comments	Colour
18/11/2020	SW112	0083_SW112_201118	QC107, QC207	27.7	1.26	236394	46055	7.63	97.8		Clear/Pink
5/03/2021	SW112	0083_SW112_210305		26.4	2.11	27607		7.38	1422		Clear
22/06/2021	SW112	0083_SW112_210622		20.5	5.83	71983	46800	8.02	118		Clear
27/11/2019	SW113		Dry								
26/05/2020	SW113	0083_SW113_200526		24	1.13	3879	2567	7.28	168.1		Brown
25/06/2020	SW113		Dry								
18/11/2020	SW113		Dry								
5/03/2021	SW113	0083_SW113_210305	Sampled from metal overflow pit	25.1	3.07	1120		8.58	120.4		Yellow
23/06/2021	SW113	0083_SW113_210623	Taken from retention at end of pipe	13.5	7.07	485.9	313	8.07	17.5		Yellow
28/11/2019	SW120		Dry								
27/05/2020	SW120	0083_SW120_200527		25.5	3.81	81516	52390	8.16	156.1		Clear
26/06/2020	SW120		DRY								
18/11/2020	SW120		DRY								
3/03/2021	SW120	0083_SW120_210303		27.4	2.7	18663		7.7	113.4		Clear
22/06/2021	SW120	0083_SW120_210622		18.5	6.71	26081	16952	8.21	95.2		Clear
28/11/2019	SW126		Dry								
27/05/2020	SW126	0083_SW126_200527	Sample area dry								
23/06/2020	SW126		Dry								
17/11/2020	SW126		Dry								
3/03/2021	SW126	0083_SW126_210303	Dry								
22/06/2021	SW126		DRY								
26/05/2020	SW127	0083_SW127_200526		23.8	5.4	46810	31161	8.38	147.6		Clear
23/06/2020	SW127		Dry								
17/11/2020	SW127		Dry								
3/03/2021	SW127	0083_SW127_210303	QC104/204	30.8	2.98	15376		8.01	82.1		Clear
22/06/2021	SW127	0083_SW127_210622		15.9	7	21870	14215	8.05	129.4		Clear
27/05/2020	SW128	0083_SW128_200527	QC101/201 taken here	24.2	3.27	62435	41210	8.4	141.9		Clear
23/06/2020	SW128		Dry								
17/11/2020	SW128		Dry								
3/03/2021	SW128	0083_SW128_210303	Rain yesterday	30.3	4.6	18145		8.14	113.6		Clear
22/06/2021	SW128	0083_SW128_210622	QC102/202. weather clear.	15	6.79	14142	9191	8.14	119.2		Clear
30/11/2019	SW130		Dry								
28/05/2020	SW130	0083_SW130_200528	Drain has been removed due to construction								

Location ID	Date	Sample ID	Sampling Depth (m)	Sampling Method	Sample Condition	Sample Description	Comments
SD112	26/05/2020	0083_SD112_200526	0.1	Shovel_Trowel			
SD112	25/06/2020	0083SD112200625	0.1	trowel			
SD112	18/11/2020	0083_SD112_201118	0.2	Direct into Bottle			
SD112	22/06/2021	0083_SD112_210622	0.15	Direct_into_Bottle	Wet	Grey/brown sandy clay	
SD112	5/03/2021	0083_SD112_210305	1	Direct into Bottle	Wet	Red clay	
SD113	26/05/2020	0083_SD113_200526	0.1	Shovel_Trowel			
SD113	25/06/2020	0083SD113200625	0.1	trowel			
SD113	18/11/2020	0083_SD113_201118	0.1	Shovel Trowel			
SD113	23/06/2021	0083_SD113_210623	0.1	Direct_into_Bottle	Dry	Brown silty sand with black organic material throughout	
SD120	27/05/2020	0083_SD120_200527	0.1	Shovel_Trowel			
SD120	26/06/2020	0083SD120200626	0.1	trowel			
SD120	18/11/2020	0083_SD120_201118	0.1	Direct into Bottle,Shovel Trowel			
SD120	22/06/2021	0083_SD120_210622	0.2	Direct_into_Bottle	Wet	Grey/black clay	
SD120	3/03/2021	0083_SD120_210303	0.15	Direct into Bottle	Wet	Grey, organic, wet clay	QC103, QC203
SD126	27/05/2020	0083_SD126_200527	0.1	Shovel_Trowel			
SD126	23/06/2020	0083SD126200623	0.1	trowel			
SD126	17/11/2020	0083_SD126_201117	0.1	Shovel Trowel			
SD126	22/06/2021	0083_SD126_210622	0.1	Direct_into_Bottle	Dry	Red/brown clay	
SD126	3/03/2021	0083_SD126_210303	0	Direct into Bottle	Dry	Clay	
SD127	26/05/2020	0083_SD127_200526	0.1	Shovel_Trowel			
SD127	23/06/2020	0083SD127200623	0.1	trowel			
SD127	17/11/2020	0083_SD127_201117	0.1	Direct into Bottle			
SD127	22/06/2021	0083_SD127_210622	0.1	Direct_into_Bottle	Wet	brown clay	
SD127	3/03/2021	0083_SD127_210303	0.1	Shovel Trowel	Wet	Orange clay	
SD128	27/05/2020	0083_SD128_200527	0.1	Shovel_Trowel			
SD128	23/06/2020	0083SD128200623	0.1	trowel			
SD128	17/11/2020	0083_SD128_201117	0.1	Direct into Bottle			
SD128	22/06/2021	0083_SD128_210622	0.1	Direct_into_Bottle	Wet	Beige sand	QC101/201
SD128	3/03/2021	0083_SD128_210303	2	Direct into Bottle	Wet	Yellow/white, salty, med sand/shell	

Monitoring Date	Monitoring Site ID	Sample_ID	Level Description	Screen Interval (bgl)	Bore Depth (m)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
26/06/2020	MW003	0083_MW003_200626	Single Level	2.0 - 5.0	5.0	2.905	3.263	0.358
17/11/2020	MW003	0083_MW003_201117	Single Level	2.0 - 5.0	5.0	3.02	3.263	0.243
22/06/2021	MW003	0083_MW003_210622	Single Level	2.0 - 5.0	5.0	2.795	3.263	0.468
30/11/2019	MW008	0083_MW8_191130	Single Level	2.5 - 5.5	5.5	2.67	2.846	0.176
26/06/2020	MW008	0083_MW008_200626	Single Level	2.5 - 5.5	5.5	2.5	2.846	0.346
17/11/2020	MW008	0083_MW008_201117	Single Level	2.5 - 5.5	5.5	2.61	2.846	0.236
22/06/2021	MW008	0083_MW008_210622	Single Level	2.5 - 5.5	5.5	2.305	2.846	0.541
28/11/2019	MW017	0083_MW17_191128	Single Level	3.0 - 6.0	6.0	3.51	3.421	-0.089
25/06/2020	MW017	0083_MW017_200625	Single Level	3.0 - 6.0	6.0	3.31	3.421	0.111
18/11/2020	MW017	0083_MW017_201118	Single Level	3.0 - 6.0	6.0	3.232	3.421	0.189
22/06/2021	MW017	0083_MW017_210622	Single Level	3.0 - 6.0	6.0	3.12	3.421	0.301
25/06/2020	MW019	0083_MW019_200625	Single Level	1.5 - 4.5	4.5	2.865	2.955	0.09
18/11/2020	MW019	0083_MW019_201118	Single Level	1.5 - 4.5	4.5	2.98	2.955	-0.025
23/06/2021	MW019	0083_MW019_210623	Single Level	1.5 - 4.5	4.5	2.61	2.955	0.345
28/11/2019	MW027	0083_MW27_191128	Single Level	3.0 - 6.0	6.0	4.6	4.499	-0.101
25/06/2020	MW027	0083_MW027_200625	Single Level	3.0 - 6.0	6.0	4.44	4.499	0.059
18/11/2020	MW027	0083_MW027_201118	Single Level	3.0 - 6.0	6.0	4.551	4.499	-0.052
23/06/2021	MW027	0083_MW027_210623	Single Level	3.0 - 6.0	6.0	4.18	4.499	0.319
25/06/2020	MW101	0083_MW101_200625	Single Level	2.0 - 4.5	4.5	2.3	2.4356	0.1356
18/11/2020	MW101	0083_MW101_201118	Single Level	2.0 - 4.5	4.5	2.473	2.4356	-0.0374
23/06/2021	MW101	0083_MW101_210623	Single Level	2.0 - 4.5	4.5	2.1	2.4356	0.336
25/06/2020	MW102	0083_MW102_200625	Single Level	1.0 - 6.0	6.0	2.59	2.6924	0.1024
18/11/2020	MW102	0083_MW102_201118	Single Level	1.0 - 6.0	6.0	2.49	2.6924	0.2024
22/06/2021	MW102	0083_MW102_210622	Single Level	1.0 - 6.0	6.0	2.4	2.6924	0.292
28/11/2019	MW103	0083_MW103_191128	Single Level	1.0 - 6.0	6.0	2.88	2.7898	-0.0902
25/06/2020	MW103	0083_MW103_200625	Single Level	1.0 - 6.0	6.0	2.735	2.7898	0.0548
18/11/2020	MW103	0083_MW103_201118	Single Level	1.0 - 6.0	6.0	2.857	2.7898	-0.0672
22/06/2021	MW103	0083_MW103_210622	Single Level	1.0 - 6.0	6.0	2.55	2.7898	0.24
28/11/2019	MW104	0083_MW104_5.5-6.0_191128	Multi level	5.5-6.0	6.0	4.05	3.9903	-0.0597
25/06/2020	MW104	0083_MW104_200625	Multi level	3.5-4.0	4.0	3.9	4.0042	0.1042
18/11/2020	MW104	0083_MW104_201118	Multi level	5.5-6.0	6.0	4.04	3.9903	-0.0497
22/06/2021	MW104	0083_MW104_5.5-6_210622	Multi level	5.5-6.0	6.0	3.65	3.9903	0.34
28/11/2019	MW105	0083_MW105_4.0191128	Multi level	4.0-4.5	4.5	3.1	3.1082	0.0082
26/06/2020	MW105	0083_MW105_200626	Multi level	4.0-4.5	4.5	2.8	3.1082	0.3082
17/11/2020	MW105	0083_MW105_201117	Multi level	4.0-4.5	4.5	2.98	3.1082	0.1282
22/06/2021	MW105	0083_MW105_210622	Multi level	4.0-4.5	4.5	2.62	3.1082	0.488
30/11/2019	MW107	0083_MW107_5.5-6.0_191130	Multi level	5.5-6.0	6.0	5.44	4.7014	-0.7386
26/06/2020	MW107	0083_MW107_200626	Multi level	7.5-8.0	8.0	4.254	4.7447	0.4907
17/11/2020	MW107	0083_MW107_201117	Multi level	5.5-6.0	6.0	4.36	4.7014	0.3414
22/06/2021	MW107	0083_MW107_3.1-4.1_210622	Multi level	3.1-4.1	4.1	2.4	4.7144	2.314
30/11/2019	MW109	0083_MW109_7.5-8.0_191130	Multi level	6.5-7.0	7.0	6.77	7.0426	0.2726
27/06/2020	MW109	0083_MW109_200627	Multi level	9.3-9.8	9.8	6.415	7.0413	0.6263
18/11/2020	MW109	0083_MW109_201118	Multi level	9.3-9.8	9.8	6.755	7.0413	0.2863
22/06/2021	MW109	0083_MW109_9.3-9.8_210622	Multi level	9.3-9.8	9.8	6.473	7.0413	0.568
26/06/2020	MW110	0083_MW110_200626	Multi level	9.0-9.5	9.5	7.705	8.2807	0.5757
18/11/2020	MW110	0083_MW110_201118	Multi level	9.0-9.5	9.5	7.872	8.2807	0.4087
22/06/2021	MW110	0083_MW110_9-9.5_210622	Multi level	9.0-9.5	9.5	7.78	8.2807	0.501
28/11/2019	MW111	0083_MW111_8.5-9.0_191128	Multi level	8.5-9.0	9.0	7.60	8.8159	1.2159
18/11/2020	MW111	0083_MW111_201118	Multi level	10.5-11.0	11.0	8.495	8.8279	0.3329
22/06/2021	MW111	0083_MW111_10.5-11_210622	Multi level	10.5-11.0	11.0	8.374	8.8279	0.454
28/11/2019	MW112	0083_MW112_4.5-5.0_191128	Multi level	4.5-5.0	5.0	2.80	2.7	-0.1
26/06/2020	MW112	0083_MW112_200626	Multi level	4.5-5.0	5.0	2.62	3.0835	0.4635
18/11/2020	MW112	0083_MW112_201118	Multi level	4.5-5.0	5.0	2.66	3.0636	0.4036
28/11/2019	MW113	0083_MW113_2.5-3.5_191128	Multi level	2.5-3.0	3.0	2.70	2.970	0.27
25/06/2020	MW113	0083_MW113_200625	Multi level	2.5-3.5	3.5	2.57	2.970	0.40
18/11/2020	MW113	0083_MW113_201118	Multi level	2.5-3.5	3.5	2.58	2.970	0.39
22/06/2021	MW113	0083_MW113_2.5-3.5_210622	Multi level	2.5-3.5	3.5	2.475	2.970	0.495
28/11/2019	MW114	0083_MW114_2.0-3.0_191128	Multi level	2.0-3.0	3.0	2.70	2.9356	0.2356
25/06/2020	MW114	0083_MW114_200625	Multi level	2.0-3.0	3.0	2.53	2.9356	0.4056
18/11/2020	MW114	0083_MW114_201118	Multi level	2.0-3.0	3.0	2.64	2.9356	0.2956
22/06/2021	MW114	0083_MW114_2-3_210622	Multi level	2.0-3.0	3.0	2.50	2.9356	0.436
28/11/2019	MW115	0083_MW115_2.0-3.0_191128	Multi level	2.0-3.0	3.0	2.46	2.6281	0.1681
25/06/2020	MW115	0083_MW115_200625	Multi level	2.0-3.0	3.0	2.308	2.6281	0.3201
18/11/2020	MW115	0083_MW115_201118	Multi level	4.5-5.0	5.0	2.41	2.6415	0.2315
22/06/2021	MW115	0083_MW115_8.5-9_210622	Multi level	8.5 - 9.0	9.0	2.36	2.6909	0.331
28/11/2019	MW116	0083_MW116_4.5-5.0_191128	Multi level	4.5-5.0	5.0	2.40	2.3885	-0.0115
25/06/2020	MW116	0083_MW116_200625	Multi level	4.5-5.0	5.0	2.21	2.3885	0.1785
22/06/2021	MW116	0083_MW116_4.5-5_210622	Multi level	4.5-5.0	5.0	2.36	2.3885	0.029
28/11/2019	MW117	0083_MW117_4-4.5_191128	Multi level	4.0-4.5	4.5	2.70	2.6554	-0.0446
23/06/2020	MW117	0083_MW117_200623	Multi level	4.0-4.5	4.5	2.295	2.6554	0.3604
17/11/2020	MW117	0083_MW117_201117	Multi level	4.0-4.5	4.5	2.57	2.6554	0.0854
22/06/2021	MW117	0083_MW117_6-6.5_210622	Multi level	6.0 - 6.5	6.5	2.32	2.7296	0.41
28/11/2019	MW119	0083_MW119_191128	Single Level	2.1 - 5.1	5.1	3.50	3.5069	0.0069
25/06/2020	MW119	0083_MW119_200625	Single Level	2.1 - 5.1	5.1	3.32	3.5069	0.1869
17/11/2020	MW119	0083_MW119_201117	Single Level	2.1 - 5.1	5.1	3.45	3.5069	0.0569
23/06/2021	MW119	0083_MW119_210623	Single Level	2.1 - 5.1	5.1	3.12	3.5069	0.387
28/11/2019	MW123	0083_MW123_191128	Single Level	0.5 - 4.5	4.5	0.80	0.5356	-0.2644
25/06/2020	MW123	0083_MW123_200625	Single Level	0.5 - 4.5	4.5	0.615	0.5356	-0.0794
18/11/2020	MW123	0083_MW123_201118	Single Level	0.5 - 4.5	4.5	0.77	0.5356	-0.2344
28/11/2019	MW129	0083_MW129_5.5-6.0_191128	Multi level	5.5-6.0	6.0	1.87	2.0047	0.1347
23/06/2020	MW129	0083_ MW129_200623	Multi level	5.5-6.0	6.0	2.045	2.0047	-0.0403
17/11/2020	MW129	0083_MW129_201117	Multi level	1.5-2.0	2.0	1.806	2.0256	0.2196
22/06/2021	MW129	0083_MW129_210622	Multi level	1.5-2.0	2.0	1.75	2.0256	0.276
28/11/2019	MW130	0083_MW130_3.4-3.9_191128	Multi level	3.4-3.9	3.9	1.97	1.3787	-0.5913
23/06/2020	MW130	0083_MW130_200623	Multi level	1.4-1.9	1.9	1.72	2.016	0.296
17/11/2020	MW130	0083_MW130_201117	Multi level	1.4-1.9	1.9	1.843	2.016	0.173
22/06/2021	MW130	0083_MW130_210622	Multi level	1.4-1.9	1.9	1.701	2.016	0.315
28/11/2019	MW134	0083_MW134_191128	Single Level	6.5 - 12.5	12.5	10.07	10.0786	0.0086
23/06/2020	MW134	0083_MW134_200623	Single Level	6.5 - 12.5	12.5	9.90	10.0786	0.1786
17/11/2020	MW134	0083_MW134_201117	Single Level	6.5 - 12.5	12.5	9.981	10.0786	0.0976

Monitoring Date	Monitoring Site ID	Sample_ID	Level Description	Screen Interval (bgl)	Bore Depth (m)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
22/06/2021	MW134	0083_MW134_210622	Single Level	6.5 - 12.5	12.5	9.75	10.0786	0.329
28/11/2019	MW202	0083_AB20_191128	Single Level	6.9 - 9.9	9.9	7.70	8.069	0.369
26/06/2020	MW202	0083_MW202_200626	Single Level	6.9 - 9.9	9.9	7.505	8.069	0.564
18/11/2020	MW202	0083_MW202_201118	Single Level	6.9 - 9.9	9.9	7.34	8.069	0.729
22/06/2021	MW202	0083_MW202_210622	Single Level	6.9 - 9.9	9.9	7.586	8.069	0.483
26/06/2020	MW210	0083_MW210_200626	Single Level	1.5 - 4.0	4.0	2.49	2.863	0.373
17/11/2020	MW210	0083_MW210_201117	Single Level	1.5 - 4.0	4.0	2.585	2.863	0.278
22/06/2021	MW210	0083_MW210_210622	Single Level	1.5 - 4.0	4.0	2.325	2.863	0.538
28/11/2019	MW212	0083_B04_191128	Single Level	1.0 - 4.0	4.0	3.305	3.513	0.208
26/06/2020	MW212	0083_MW212_200626	Single Level	1.0 - 4.0	4.0	3.13	3.513	0.383
17/11/2020	MW212	0083_MW212_201117	Single Level	1.0 - 4.0	4.0	3.24	3.513	0.273
22/06/2021	MW212	0083_MW212_210622	Single Level	1.0 - 4.0	4.0	2.95	3.513	0.563
28/11/2019	MW213	0083_BDDB05_191128	Single Level	1.0 - 4.0	4.0	4.60	4.490	-0.11
25/06/2020	MW213	0083_MW213_200625	Single Level	2.5 - 5.5	5.5	4.20	4.490	0.29
23/06/2021	MW213	0083_MW213_210623	Single Level	2.5 - 5.5	5.5	4.19	4.490	0.30
28/11/2019	MW214	0083_B05_191128	Single Level	2.5 - 5.5	5.5	4.38	4.290	-0.09
18/11/2020	MW214	0083_MW213_201118	Single Level	2.5 - 5.5	5.5	4.385	4.290	0.105
22/06/2021	MW214	0083_MW214_210622	Single Level	2.5 - 5.5	5.5	3.74	4.290	0.55
28/11/2019	MW217	0083_B09_191128	Single Level	1.2 - 4.5	4.5	3.60	3.658	0.058
26/06/2020	MW217	0083_MW217_200626	Single Level	1.2 - 4.5	4.5	3.40	3.658	0.258
18/11/2020	MW217	0083_MW217_201118	Single Level	1.2 - 4.5	4.5	3.53	3.658	0.128
22/06/2021	MW217	0083_MW217_210622	Single Level	1.2 - 4.5	4.5	3.60	3.658	0.058
28/11/2019	MW218	0083_B10_191128	Single Level	2.8 - 5.8	5.8	5.10	5.137	0.037
26/06/2020	MW218	0083_MW218_200626	Single Level	2.8 - 5.8	5.8	4.860	5.137	0.277
17/11/2020	MW218	0083_MW218_201117	Single Level	2.8 - 5.8	5.8	4.997	5.137	0.14
22/06/2021	MW218	0083_MW218_210622	Single Level	2.8 - 5.8	5.8	4.810	5.137	0.327

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - POL Storage Area	Constituent:	Sum of PFOS & PFHxS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW003	MW008	MW105	MW119	MW210	MW212	
Sampling Event	Sampling Date	SUM OF PFOS & PFHXS CONCENTRATION (ug/L)					
1	1-Feb-18	3.24	2.13	1.2	9.7	0.019	0.0005	
2	1-Jun-18	2.68	15	0.25	10.09	0.079	0.006	
3	1-Nov-19	18.6	8.92	0.4	4.24	0.0005	0.02	
4	1-Mar-20		0.62			0.0005	0.0005	
5	1-Jun-20	2.62	8.54	0.14	12.6	0.0005	0.0005	
6	1-Nov-20	16.1	0.4	0.31	8.12	0.0005	0.0005	
7	1-Jun-21	0.04	0.08	0.0005	7.84	0.0005	0.03	
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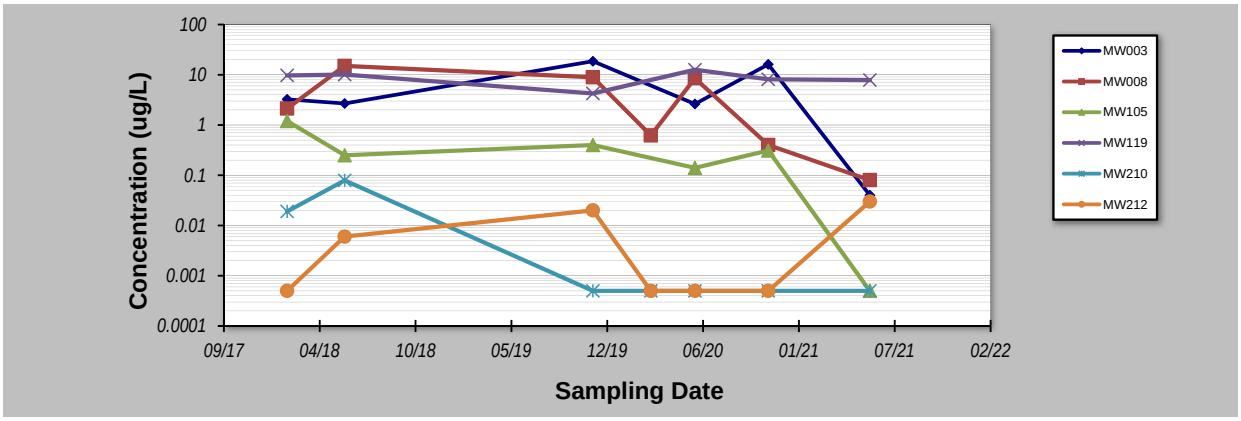
Coefficient of Variation:		1.10	1.13	1.10	0.32	2.04	1.44	
Mann-Kendall Statistic (S):		-5	-13	-9	-3	-9	3	
Confidence Factor:		76.5%	96.5%	93.2%	64.0%	88.1%	61.4%	
Concentration Trend:		No Trend	Decreasing	Prob. Decreasing	Stable	No Trend	No Trend	



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - POL Storage Area	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW003	MW008	MW105	MW119	MW210	MW212
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)					
1	1-Feb-18	0.029	0.05	0.29	0.13	0.0005	0.0005
2	1-Jun-18	0.06	0.36	0.007	0.13	0.004	0.0005
3	1-Nov-19	1.34	0.51	0.03	0.04	0.0005	0.0005
4	1-Mar-20		0.01			0.0005	0.0005
5	1-Jun-20	0.04	0.27	0.0005	0.22	0.0005	0.0005
6	1-Nov-20	0.18	0.0005	0.03	0.14	0.0005	0.0005
7	1-Jun-21	0.01	0.0005	0.0005	0.16	0.0005	0.0005
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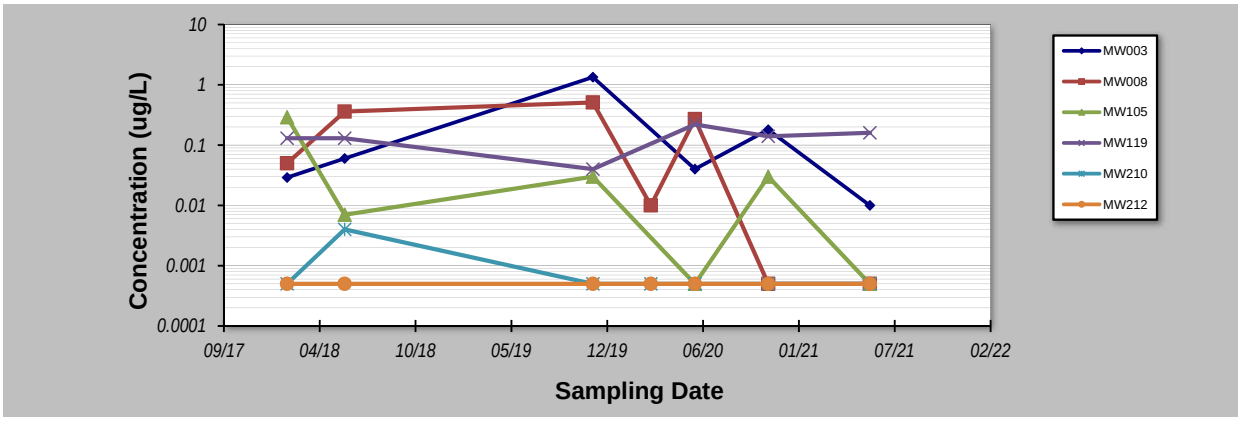
Coefficient of Variation:		1.90	1.21	1.90	0.43	1.32	0.00
Mann-Kendall Statistic (S):		-1	-10	-7	6	-4	0
Confidence Factor:		50.0%	90.7%	86.4%	81.5%	66.7%	37.9%
Concentration Trend:		No Trend	Prob. Decreasing	No Trend	No Trend	No Trend	Stable



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **4-Oct-21**
Facility Name: **HEH-A - POL Storage Area**
Conducted By: **Cardno**

Job ID: **DEF19009**
Constituent: **PFOS**
Concentration Units: **ug/L**

Sampling Point ID:	MW003	MW008	MW105	MW119	MW210	MW212	
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	3	1.9	0.68	0.067	0.002	0.0005	
2	1-Jun-18	2.4	13	0.2	0.091	0.003	0.0005	
3	1-Nov-19	15.5	7.42	0.24	0.06	0.0005	0.0005	
4	1-Mar-20		0.56			0.0005	0.0005	
5	1-Jun-20	2.46	7.47	0.12	0.19	0.0005	0.0005	
6	1-Nov-20	15.3	0.4	0.22	0.1	0.0005	0.0005	
7	1-Jun-21	0.0005	0.08	0.0005	0.11	0.0005	0.0005	
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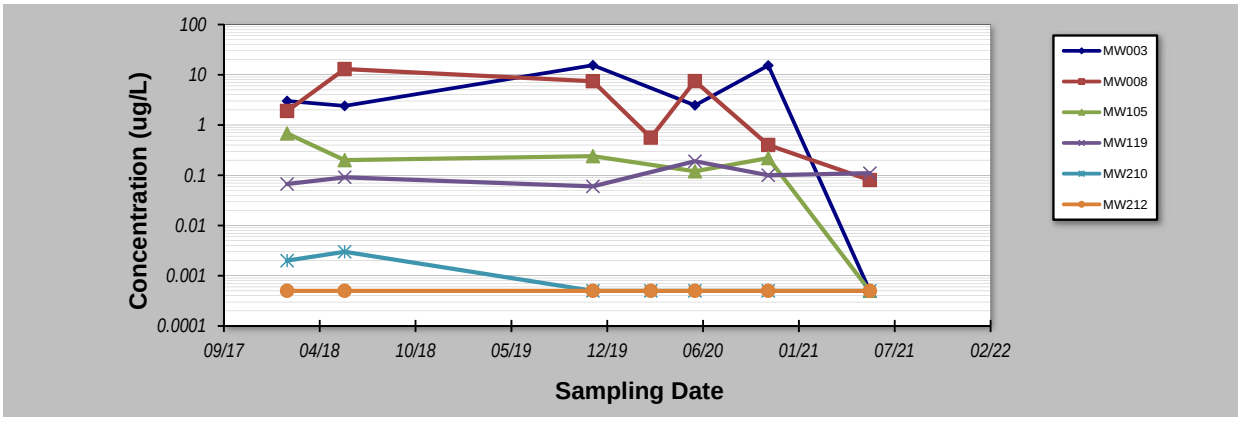
Coefficient of Variation:		1.09	1.13	0.95	0.45	0.95	0.00	
Mann-Kendall Statistic (S):		-3	-11	-9	7	-9	0	
Confidence Factor:		64.0%	93.2%	93.2%	86.4%	88.1%	37.9%	
Concentration Trend:		No Trend	Prob. Decreasing	Prob. Decreasing	No Trend	Stable	Stable	



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Powerhouse Area	Constituent:	Sum of PFOS and PFHxS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW017	MW019	MW027	MW101	MW102	MW103	MW104
Sampling Event	Sampling Date	SUM OF PFOS AND PFHXS CONCENTRATION (ug/L)						
1	1-Feb-18	13.6	0.116	0.53	0.491	0.744	1.31	0.005
2	1-Jun-18	17.8	0.093	0.288	0.537	0.54	1.008	0.002
3	1-Nov-19	17.2		0.39			1.23	0.01
4	1-Mar-20		0.06					
5	1-Jun-20	11.5	0.1	0.33	0.24	0.22	0.68	0.02
6	1-Nov-20	17	0.03	0.33	0.25	0.45	0.51	0.0005
7	1-Jun-21	10.7	0.02	0.27	0.31	0.36	0.59	0.0005
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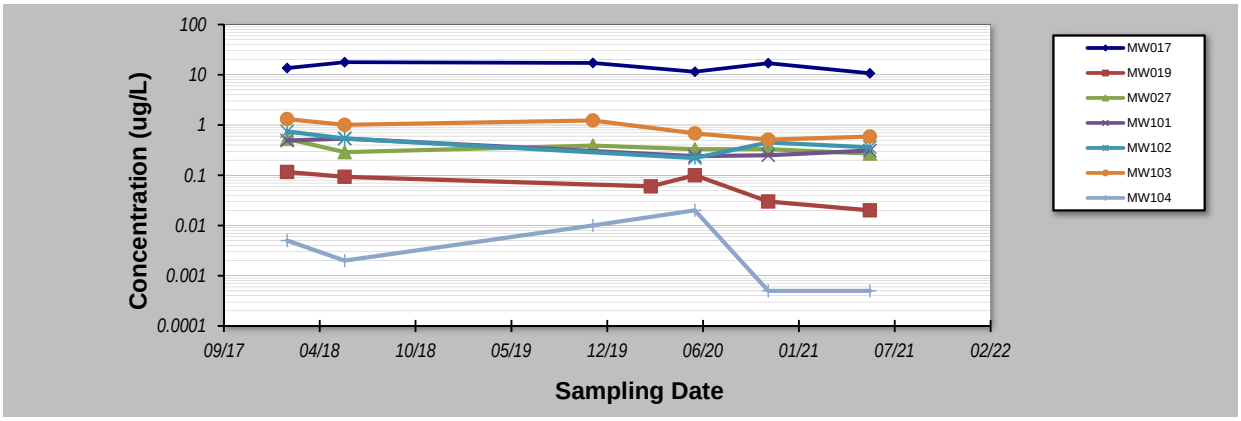
Coefficient of Variation:		0.21	0.56	0.27	0.38	0.42	0.38	1.20
Mann-Kendall Statistic (S):		-7	-11	-8	-2	-6	-11	-4
Confidence Factor:		86.4%	97.2%	89.8%	59.2%	88.3%	97.2%	70.3%
Concentration Trend:		Stable	Decreasing	Stable	Stable	Stable	Decreasing	No Trend



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **4-Oct-21**
Facility Name: **HEH-A - Powerhouse Area**
Conducted By: **Cardno**
Job ID: **DEF19009**
Constituent: **Sum of PFOS and PFHxS**
Concentration Units: **ug/L**

Sampling Point ID:	MW123	MW214	MW213				
Sampling Event	Sampling Date	SUM OF PFOS AND PFHXS CONCENTRATION (ug/L)						
1	1-Feb-18	0.001	0.028	0.09				
2	1-Jun-18	0.0005	0.043	0.091				
3	1-Nov-19	0.0005	0.06	0.0005				
4	1-Mar-20							
5	1-Jun-20	0.0005	0.07					
6	1-Nov-20	0.0005	0.03					
7	1-Jun-21		0.06	0.0005				
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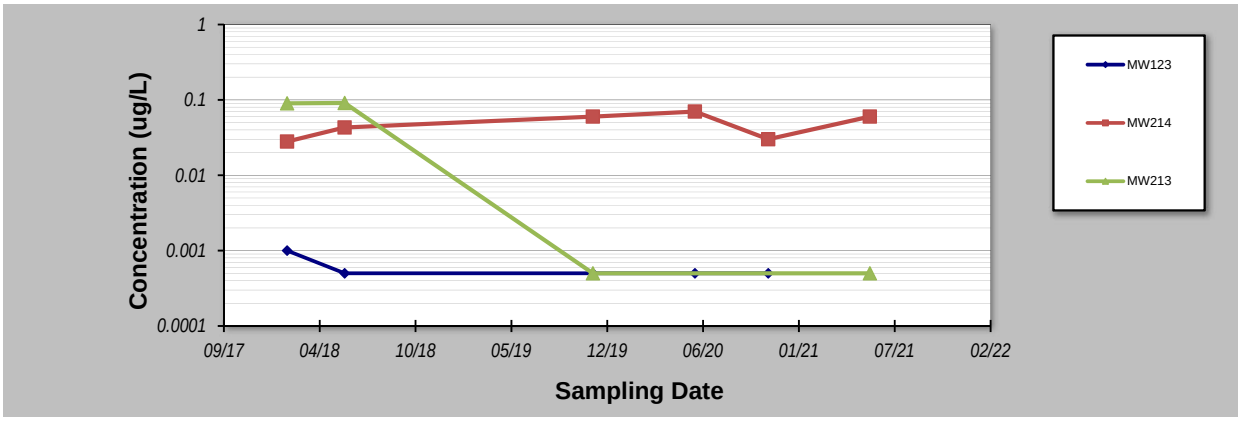
Coefficient of Variation:		0.37	0.36	1.14				
Mann-Kendall Statistic (S):		-4	6	-3				
Confidence Factor:		75.8%	81.5%	72.9%				
Concentration Trend:		Stable	No Trend	No Trend				



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Powerhouse Area	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW017	MW019	MW027	MW101	MW102	MW103	MW104
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	2.1	0.0005	0.031	0.11	0.12	0.084	0.003
2	1-Jun-18	1.6	0.0005	0.012	0.047	0.13	0.051	0.0005
3	1-Nov-19	0.92		0.02			0.04	0.0005
4	1-Mar-20		0.0005					
5	1-Jun-20	0.78	0.0005	0.01	0.03	0.0005	0.03	0.0005
6	1-Nov-20	0.8	0.0005	0.01	0.02	0.06	0.02	0.0005
7	1-Jun-21	0.54	0.0005	0.0005	0.05	0.1	0.04	0.0005
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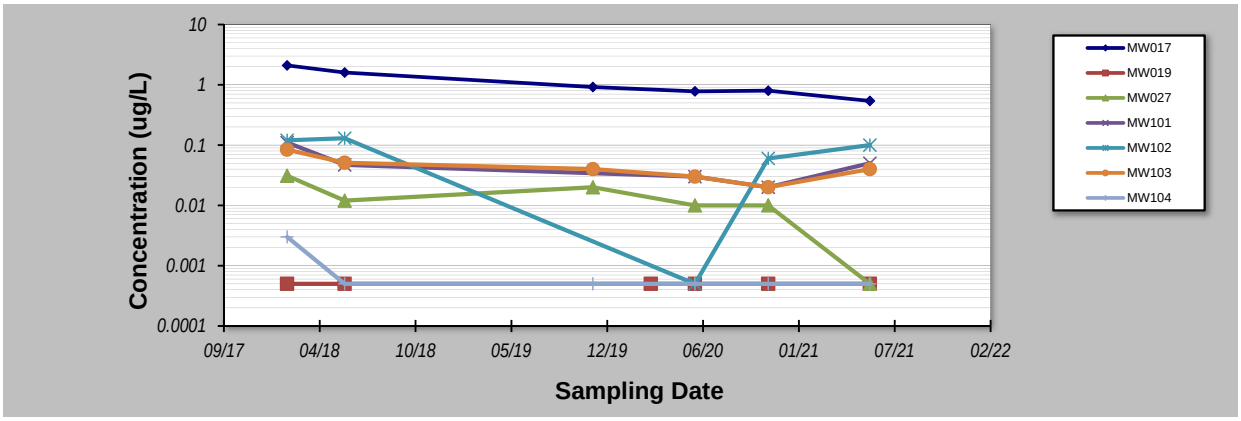
Coefficient of Variation:		0.53	0.00	0.75	0.68	0.64	0.50	1.11
Mann-Kendall Statistic (S):		-13	0	-12	-4	-2	-10	-5
Confidence Factor:		99.2%	39.3%	98.2%	75.8%	59.2%	95.2%	76.5%
Concentration Trend:		Decreasing	Stable	Decreasing	Stable	Stable	Decreasing	No Trend



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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Powerhouse Area	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW123	MW214	MW213				
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.0005	0.004	0.005				
2	1-Jun-18	0.0005	0.006	0.004				
3	1-Nov-19	0.0005	0.0005	0.0005				
4	1-Mar-20							
5	1-Jun-20	0.0005	0.0005					
6	1-Nov-20	0.0005	0.0005					
7	1-Jun-21		0.0005	0.0005				
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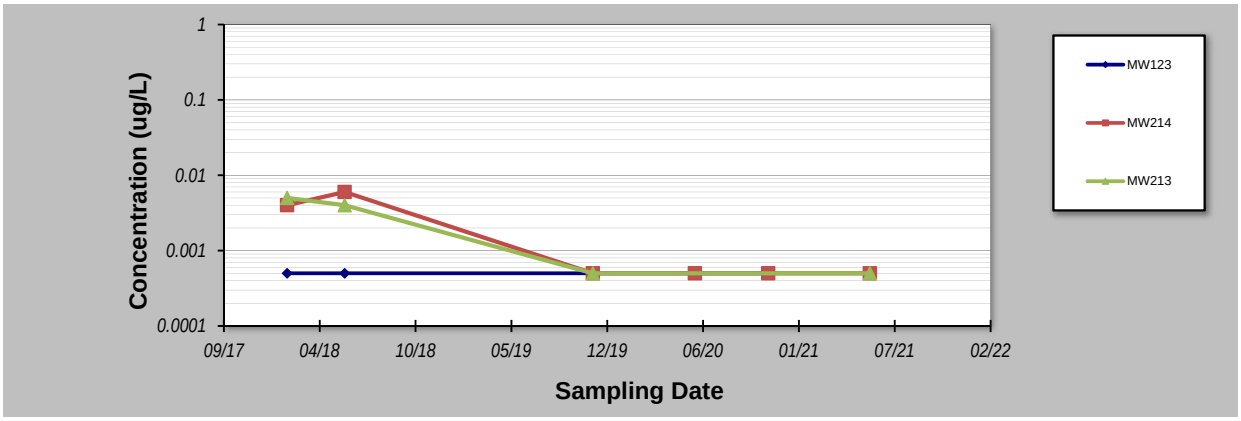
Coefficient of Variation:		0.00	1.20	0.94				
Mann-Kendall Statistic (S):		0	-7	-5				
Confidence Factor:		40.8%	86.4%	89.6%				
Concentration Trend:		Stable	No Trend	Stable				



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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Powerhouse Area	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW017	MW019	MW027	MW101	MW102	MW103	MW104
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	7.8	0.016	0.14	0.041	0.084	0.11	0.002
2	1-Jun-18	12	0.016	0.088	0.047	0.04	0.078	0.001
3	1-Nov-19	14.2		0.09			0.06	0.01
4	1-Mar-20		0.0005					
5	1-Jun-20	10.1	0.03	0.1	0.0005	0.05	0.08	0.02
6	1-Nov-20	15.4	0.0005	0.09	0.0005	0.06	0.06	0.0005
7	1-Jun-21	9.72	0.0005	0.1	0.0005	0.05	0.09	0.0005
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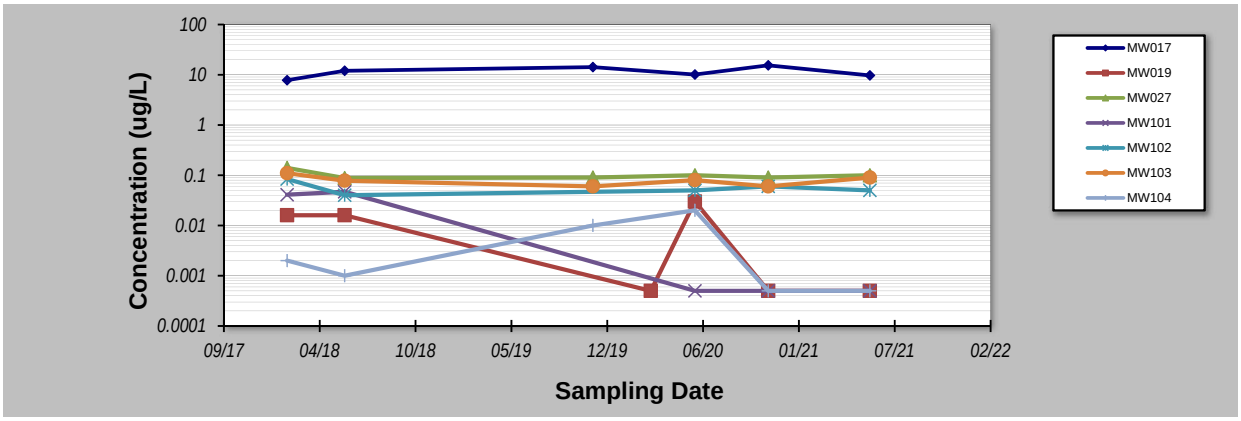
Coefficient of Variation:		0.25	1.15	0.19	1.34	0.30	0.24	1.40
Mann-Kendall Statistic (S):		3	-5	1	-5	-1	-2	-4
Confidence Factor:		64.0%	76.5%	50.0%	82.1%	50.0%	57.0%	70.3%
Concentration Trend:		No Trend	No Trend	No Trend	No Trend	Stable	Stable	No Trend



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3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Powerhouse Area	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW123	MW214	MW213				
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	0.001	0.011	0.027				
2	1-Jun-18	0.0005	0.013	0.02				
3	1-Nov-19	0.0005	0.013	0.0005				
4	1-Mar-20							
5	1-Jun-20	0.0005	0.04					
6	1-Nov-20	0.0005	0.03					
7	1-Jun-21		0.02	0.0005				
8								
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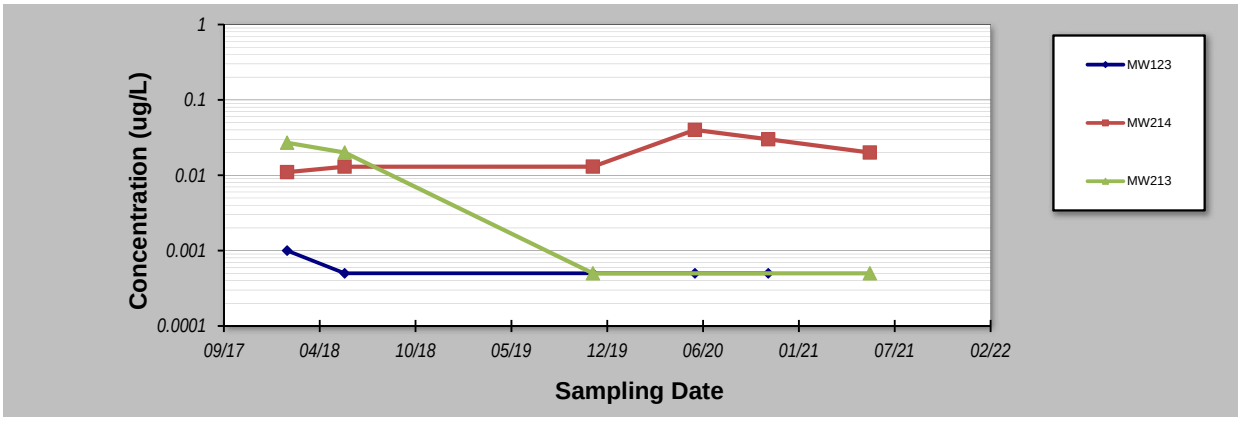
19								
20								
Coefficient of Variation:		0.37	0.55	1.13				
Mann-Kendall Statistic (S):		-4	8	-5				
Confidence Factor:		75.8%	89.8%	89.6%				
Concentration Trend:		Stable	No Trend	No Trend				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Boundary	Constituent:	Sum of PFOS & PFHxS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW129	MW130	MW134				
Sampling Event	Sampling Date	SUM OF PFOS & PFHXS CONCENTRATION (ug/L)						
1	17-Jun-18	0.012	0.0005					
2	23-Jun-18			0.008				
3	28-Nov-19	0.11	0.01	0.0005				
4	23-Jun-20	0.02	0.0005	0.0005				
5	17-Nov-20	0.0005	0.0005	0.0005				
6	22-Jun-21	0.75	0.0005	0.0005				
7								
8								
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10								
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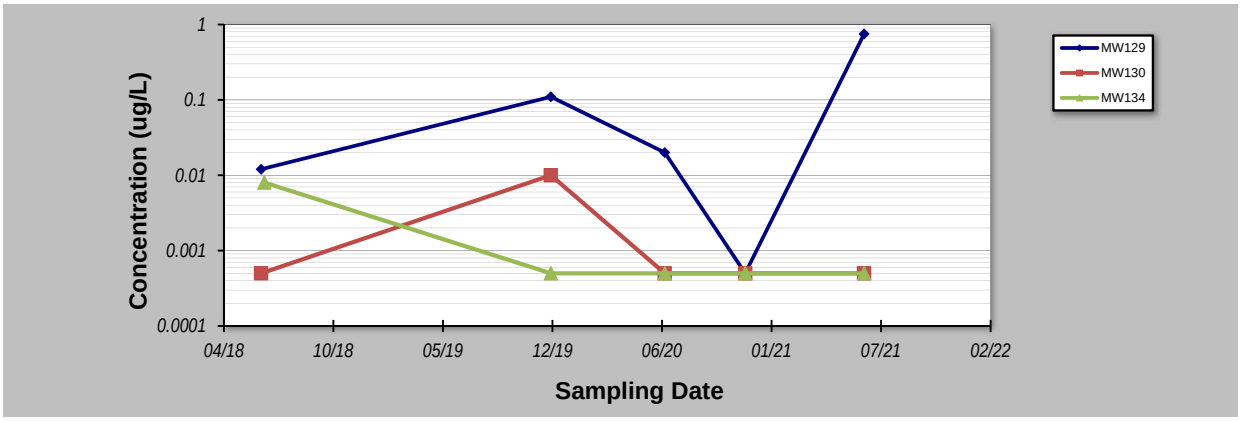
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		1.81	1.77	1.68				
Mann-Kendall Statistic (S):		2	-2	-4				
Confidence Factor:		59.2%	59.2%	75.8%				
Concentration Trend:		No Trend	No Trend	No Trend				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **4-Oct-21**
Facility Name: **HEH-A - Boundary**
Conducted By: **Cardno**
Job ID: **DEF19009**
Constituent: **PFOA**
Concentration Units: **ug/L**

Sampling Point ID:	MW129	MW130	MW134				
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	17-Jun-18	0.007	0.0005					
2	23-Jun-18			0.003				
3	28-Nov-19	0.0005	0.0005	0.0005				
4	23-Jun-20	0.0005	0.0005	0.0005				
5	17-Nov-20	0.0005	0.0005	0.0005				
6	22-Jun-21	0.0005	0.0005	0.0005				
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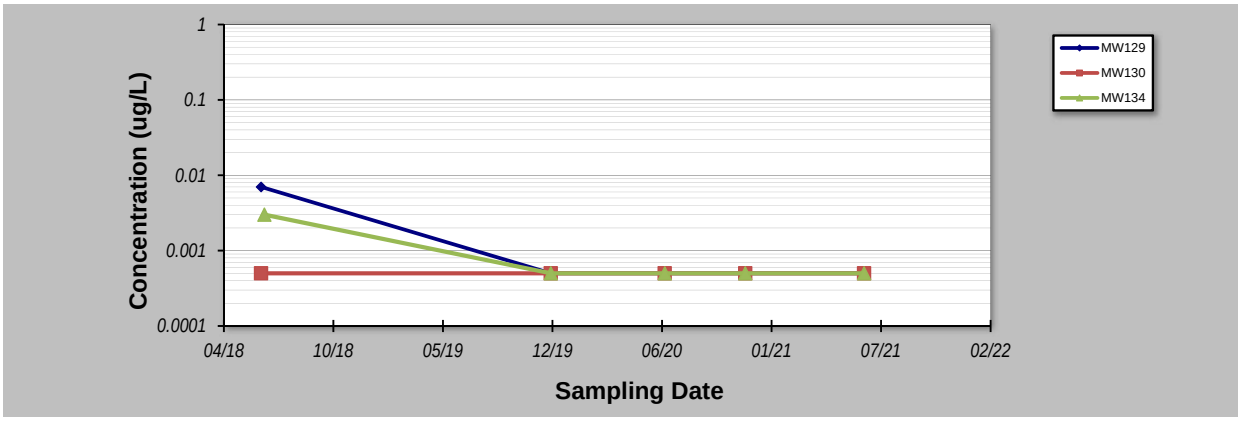
19								
20								
Coefficient of Variation:		1.61	0.00	1.12				
Mann-Kendall Statistic (S):		-4	0	-4				
Confidence Factor:		75.8%	40.8%	75.8%				
Concentration Trend:		No Trend	Stable	No Trend				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	MW134	Job ID:	DEF19009
Facility Name:	HEH-A - Boundary	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW129	MW130	MW134				
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	17-Jun-18	0.008	0.0005					
2	23-Jun-18			0.005				
3	28-Nov-19	0.07	0.01	0.0005				
4	23-Jun-20	0.02	0.0005	0.0005				
5	17-Nov-20	0.0005	0.0005	0.0005				
6	22-Jun-21	0.72	0.0005	0.0005				
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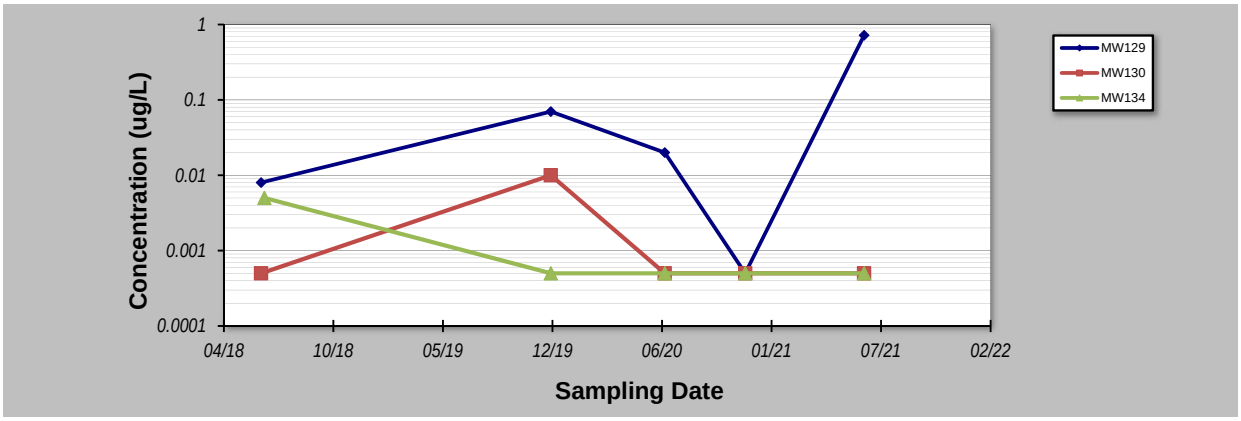
19								
20								
Coefficient of Variation:		1.91	1.77	1.44				
Mann-Kendall Statistic (S):		2	-2	-4				
Confidence Factor:		59.2%	59.2%	75.8%				
Concentration Trend:		No Trend	No Trend	No Trend				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Surface water	Constituent:	PFOS and PFHxS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	SW112	SW113	SW120	SW127	SW128		
Sampling Event	Sampling Date	PFOS AND PFHXS CONCENTRATION (ug/L)						
1	1-Mar-18	0.0005	2.4					
2	4-Jun-18	0.008	1.3	0.002	0.002	0.0005		
3	28-Nov-19	0.0005						
4	26-May-20	0.0005	0.65	0.0005	0.0005	0.0005		
5	25-Jun-20	0.05						
6	18-Nov-20	0.0005						
7	5-Mar-21	0.0005	0.35	0.0005	0.0005	0.0005		
8	22-Jun-21	0.0005	0.13	0.0005	0.0005	0.0005		
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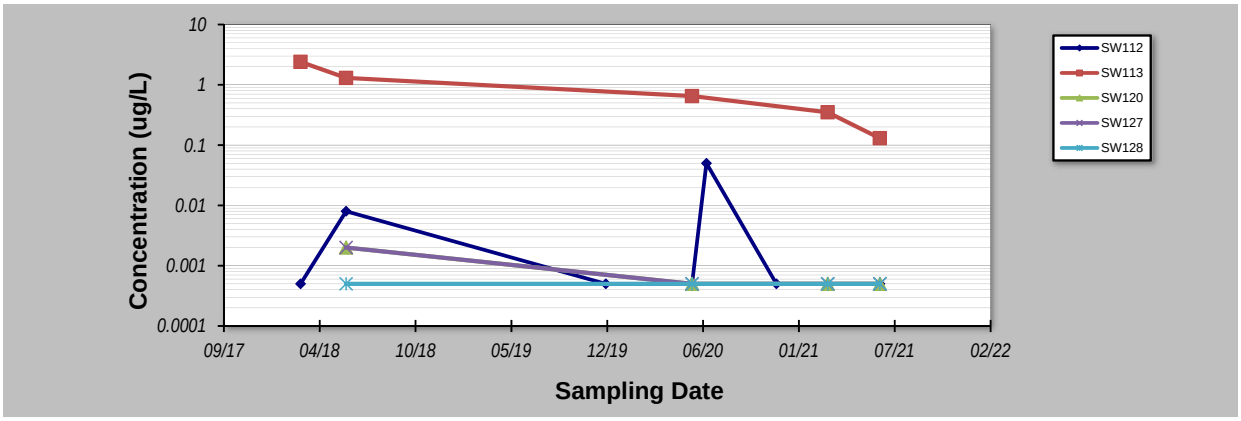
Coefficient of Variation:		2.27	0.95	0.86	0.86	0.00		
Mann-Kendall Statistic (S):		-3	-10	-3	-3	0		
Confidence Factor:		59.4%	99.2%	72.9%	72.9%	37.5%		
Concentration Trend:		No Trend	Decreasing	Stable	Stable	Stable		



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Oct-21	Job ID:	DEF19009
Facility Name:	HEH-A - Surface water	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	SW112	SW113	SW120	SW127	SW128		
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Mar-18	0.0005	0.86					
2	4-Jun-18	0.0005	0.31	0.0005	0.0005	0.0005		
3	28-Nov-19	0.0005						
4	26-May-20	0.0005	0.22	0.0005	0.0005	0.0005		
5	25-Jun-20	0.0005						
6	18-Nov-20	0.0005						
7	5-Mar-21	0.0005	0.12	0.0005	0.0005	0.0005		
8	22-Jun-21	0.0005	0.07	0.0005	0.0005	0.0005		
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18								
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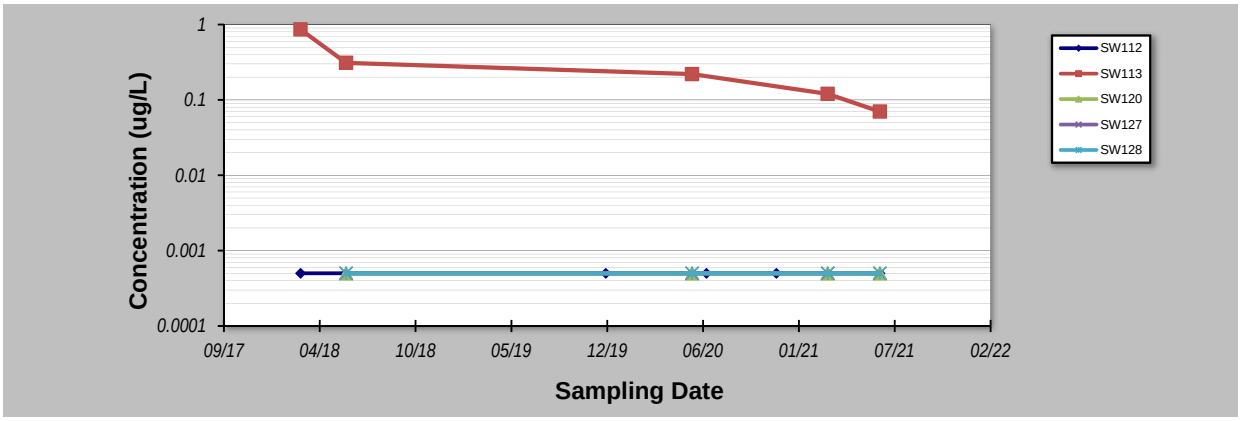
20								
Coefficient of Variation:		0.00	1.01	0.00	0.00	0.00		
Mann-Kendall Statistic (S):		0	-10	0	0	0		
Confidence Factor:		45.2%	99.2%	37.5%	37.5%	37.5%		
Concentration Trend:		Stable	Decreasing	Stable	Stable	Stable		



Notes:

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2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water* , 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: **4-Oct-21**
Facility Name: **HEH-A - Surface water**
Conducted By: **Cardno**
Job ID: **DEF19009**
Constituent: **PFOS**
Concentration Units: **ug/L**

Sampling Point ID:	SW112	SW113	SW120	SW127	SW128		
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Mar-18	0.0005	1.1					
2	4-Jun-18	0.008	0.81	0.002	0.002	0.0005		
3	28-Nov-19	0.0005						
4	26-May-20	0.0005	0.34	0.0005	0.0005	0.0005		
5	25-Jun-20	0.05						
6	18-Nov-20	0.0005						
7	5-Mar-21	0.0005	0.21	0.0005	0.0005	0.0005		
8	22-Jun-21	0.0005	0.1	0.0005	0.0005	0.0005		
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10								
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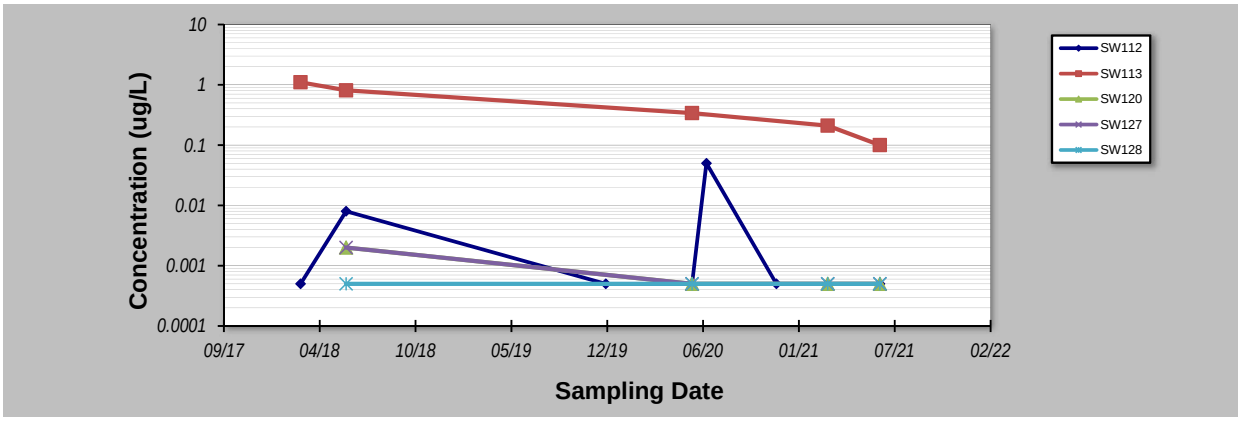
17								
18								
19								
20								
Coefficient of Variation:		2.27	0.83	0.86	0.86	0.00		
Mann-Kendall Statistic (S):		-3	-10	-3	-3	0		
Confidence Factor:		59.4%	99.2%	72.9%	72.9%	37.5%		
Concentration Trend:		No Trend	Decreasing	Stable	Stable	Stable		



Notes:

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