2021 Annual Interpretive Report

Naval Communication Station Harold E Holt Area B - PFAS OMP

DEF19009

Prepared for

Department of Defence

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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 Naval Communication Station Harold E Holt – Area B, Western Australia ('HEH-B' 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, seepage water, surface water and sediment originating from HEH-B. The monitoring program consists of post-summer and post-winter monitoring events, as well as '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 measure 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 (DSI) 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 33 groundwater wells, six seepage water locations and 11 co-located sediment and surface water locations, as specific in the OMP. The first flush event, conducted in March 2021, comprised the monitoring of 11 sediment and surface water locations following the first heavy rainfall of the wet season.

Groundwater elevation data was collected from 33 groundwater wells during the biannual monitoring events.

Works were conducted in general accordance with the methodologies detailed in the Sampling and Analysis Quality Plan (SAQP) (Cardno, 2021a), 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 generally consistent between the two GMEs and the 2018 DSI; all indicated a groundwater flow direction from the site infrastructure eastward towards the Exmouth Gulf.

One difference observed was during the June 2021 groundwater monitoring event (GME), where a westerly groundwater flow direction was interpreted in the westernmost area of the site; Groundwater elevations can be influenced by ocean tides in some locations near to the coastline, and it is noted that the groundwater level measurements were collected over several days and tide cycles.

[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

PFAS Concentrations

The groundwater results recorded during the reporting period remained within the same order of magnitude as historical data.

No first-time detections or new exceedances of guideline values were reported for the off-site monitoring wells.

PFAS concentrations were graphed over time and interpreted for all groundwater monitoring locations. Trend analysis predominantly indicated that there were either stable or no statistically significant trends. Notable exceptions are:

> Potential increasing trends were observed for Perfluorooctanoic Acid (PFOA) and Sum of Perfluorooctane Sulfonate (PFOS) and Perfluorohexane Sulfonate (PFHxS) in groundwater beneath the site (including MW115 and MW126 in Source Area South, MW326 in Source Area North and MW154S east of the site infrastructure).

> Potential decreasing trends were also observed for PFOA and Sum of PFOS and PFHxS in groundwater at Source Area South (including MW103D and MW143).

> A “probably decreasing” trend, as determined through statistical analysis, was reported for PFOA at two groundwater monitoring locations (MW022 and MW118D) near an off-site surface water drain and one groundwater monitoring location near the coastline (MW132).

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.

Additional monitoring rounds will be required to understand what these observations mean for the locations.

Seepage Water Results

Seepage water is water that is present in the ground and is moving between surface water and groundwater. There were no detections of PFAS recorded above the laboratory limit of reporting (LOR) during the monitoring period for seepage water.

Surface Water Results

All surface water sampling locations were either dry or did not detect PFAS concentrations above the laboratory LOR.

Sediment Results

All sediment concentrations were recorded below the adopted human health and ecological assessment criteria with one exception within the off-site drain (SS164 located closest to the site) which reported a first-time exceedance of the HEPA (2020) ecological indirect exposure criteria (0.01 mg/kg). Given the absence of surface water flow in the main drain (Pathway Area 2) it is considered that PFAS migration with surface water that could result in increased concentrations in sediment would be a very slow process. It is considered the sediment sampling locations are adequately positioned to assess changes in surface water runoff and resulting sediment impacts and will continue to be assessed in future monitoring rounds.

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.

Risk Summary

The evaluation of analytical results does not suggest the nature and extent of PFAS in groundwater, seepage water, surface water or sediment 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 (such as land and aquatic flora and fauna) identified during the DSI (GHD, 2018) have been reviewed and are still considered to be appropriate and the OMP data collected to date does not suggest any significant changes to these mechanisms or risks.

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, including these collected as part of the 3-year implementation of the OMP, there is no significant change to the above 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 monitoring period.

Conclusions

The nature and extent of PFAS across all media has not changed from the understanding presented in the investigation phases, PMAP and 2020 AIR. Possible trends (both decreasing and increasing depending on the location and analyte under review) are noted at some groundwater monitoring locations throughout the monitoring area. It is possible that the plume could be migrating with groundwater towards the east as an increasing trend was noted at MW154S. However, it is either not reaching the coastline or dilution is occurring prior as the receptor wells and seepage water monitoring locations aren't detecting any PFAS concentration.

The 2020 - 2021 monitoring results met the objective of the OMP and was carried out in general accordance with the SAQP. Based on the current available data there is no significant change to the risk profile of the management area.

Given the remaining PFAS concentrations at the on-site source areas, the ongoing monitoring program is being continued to further support temporal data trend assessment, plume behaviour and associated risk findings.

The monitoring results did not identify a change in the risk profile for the Management Area that would trigger the need for an OMP review. However, the OMP will be revised as the initial 3-year OMP implementation period has been reached.

Table of Contents

Appendices

Tables

Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per and Poly-fluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane 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
FTA	Fire Training Area

1 Introduction

The Australian Department of Defence ('Defence' or 'Client') engaged Cardno now Stantec (Cardno) to undertake the November 2020, first flush 2021 (March 2021) and June 2021 groundwater, seepage water, surface water and sediment monitoring event at and around Naval Communication Station Harold E Holt – Area B, Western Australia (WA) ('HEH-B', 'Base' or the 'site') as part of the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP).

The site is located at the end of the North West Cape of Western Australia (WA), at the northern edge of Exmouth and is displayed in Figure 1, Appendix A.

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-B, 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 Harold E Holt – Area B.
- The 'Management Area' is defined as comprising the site, plus the land extending to the Exmouth Gulf (to the east and northeast) (Figure 2, Appendix A).

The site has been subject to several PFAS investigations prior to the start of the OMP implementation, including:

- Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B PFAS 'Management Area Plan'.
- Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Ongoing Monitoring Plan'
- GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area B PFAS Investigations Detailed Site Investigation Report'.
- GHD Pty Ltd, May 2019, reference: 3135526, 'Harold E Holt B Ecological Risk Assessment'.

1.2 Purpose and 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 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, 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):

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

The assessment included the following main components:

1. Undertake the November 2020 groundwater, surface water and sediment monitoring event:
   - Gauging of 33 single and multi-level groundwater monitoring wells;
   - Sampling of 33 groundwater monitoring wells;
   - Sampling six seepage water locations;
   - Sampling one surface water location; and
   - Sampling 11 sediment locations.
2. Undertake the 2021 First Flush (March 2021) surface water and sediment monitoring event:
   - Sampling of four surface water sampling locations; and
   - Sampling of 11 sediment sampling locations
3. Undertake the June 2021 groundwater, surface water and sediment monitoring event:
   - Gauging of 33 single and multi-level groundwater monitoring wells;
   - Sampling of 33 groundwater monitoring wells;
   - Sampling six seepage water locations;
   - Sampling four surface water locations; and
   - Sampling 11 sediment locations.
4. Data assessment and reporting for the November 2020 – October 2021 monitoring 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 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 Setting

HEH-B is located approximately 2.0 kilometres north of Exmouth, 1,250 km north of Perth and covers an area of 2,020 hectares (ha). HEH-B was established in 1967 and is host to a High Frequency (HF) transmitter and associated administration facilities.

The site is situated at the end of the North West Cape of WA, at the northern edge of Exmouth. The majority of the buildings and associated infrastructure and support services are located in the northern portion of the site and include:

- HF transmitter;
- Base administration facilities;
- Service facilities including vehicle maintenance workshop;
- Former recreational and living quarters;
- Waste water treatment plant (WWTP);
- Water treatment plant (WTP);
- Firefighting services and training area (current and former);
- Landfill areas including Class IV landfill and asbestos landfill;
- Lease areas for non-military use including Sea Breeze Resort (no longer in active use); and
- Other activities include former fuel storage and distribution, in above and below ground tanks and chemical storage (including paints and solvents).

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 Road, North West Cape, WA 6707
Land Description	Harold E Holt Area B
Owner	Commonwealth of Australia
Title Details	Lot 43 on Plan P209471 and Lot 78 on Plan P211955
Planning Zone / Land use	Public Purposes – Government Services
Local Government Authority (LGA)	Shire of Exmouth
Boundary corner coordinate (eastings and northings in GDA94, Zone 50)	▪ North-west corner: 199,167 mE, 7,576,901 mN ▪ North-east corner: 205,188 mE, 7,577,210 mN ▪ South-west corner: 204,428 mE, 7,572,508 mN ▪ South-east corner: 199,212 mE, 7,574,561 mN

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	Vacant crown land (open space)
West	Vacant crown land (open space); Ningaloo Marine Park further to the west
East	Exmouth Gulf, used for commercial aquaculture activities (prawn fishing)
South	Exmouth township

2.3 Management Area Description

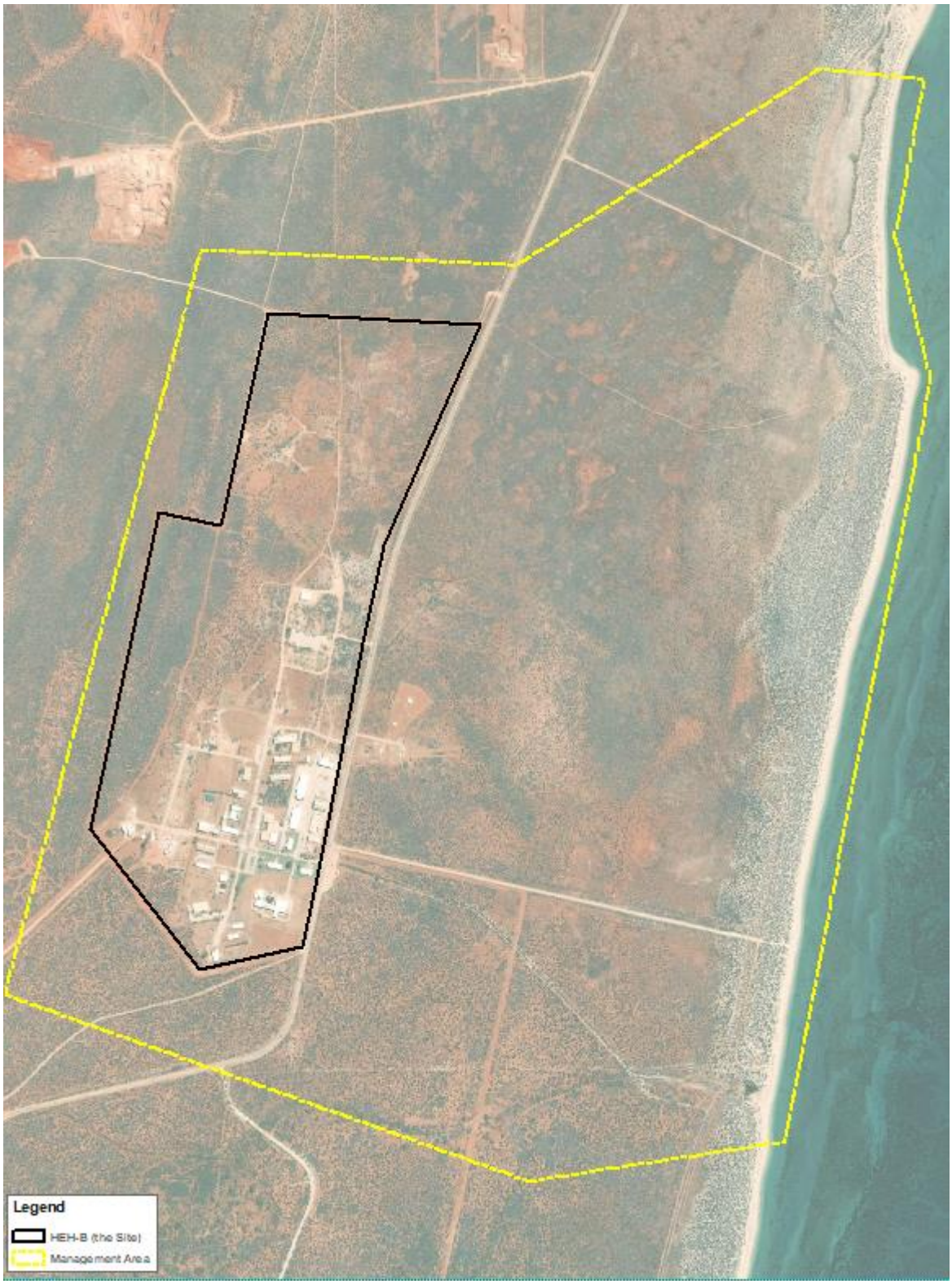
The OMP includes sampling and analysis not only from the site, but also from a number of surrounding (off-site) waterways, groundwater monitoring wells and seepage locations. The site and these surrounding areas are collectively referred to as the 'Management Area'. The Management Area boundaries are presented on Figure 2, Appendix A and Figure 2-1 below.

The 'Management Area' includes:

- The on and off-site source areas (as described in Section 2.5)
- Land to the east and northeast of the Base (down-gradient) to the coastline (Receptor C) and including the backwater lagoon area (Receptor B).
- The drainage channel southeast of the Base (Pathway 2).

The Management Area excludes the site supply borefield located to the southwest of the site (up-gradient). This is because, while the previous investigations identified PFOS and/or PFHxS above the LOR in six of the 15 wells, the concentrations were an order of magnitude lower than the nominated human health drinking water criteria (GHD 2018 and 2019).

Figure 2-1 Management Area



2.4 Environmental Setting

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

Table 2-3 Site Environmental Setting Key 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-B typically ranges between 1 and 20 metres relative to the Australian Height Datum (mAHD). A natural ridge line runs north/south along the western boundary of the site, with the southwest portion of the site (specifically the water tower) being higher than the surrounding area.
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 superficial colluvium, comprising poorly sorted clay, silt, sand and gravel. Logs indicated between 1.0 to 6.0 m of red silty sand at the surface, below which the sand becomes denser and weakly cemented in places with coral limestone or shell fragments.
Acid Sulfate Soil	A review of the Acid Sulfate Soils (ASS) risk mapping, available on the WA Atlas online database indicates that the area encompassing the site is classified as having no known ASS disturbance risk. The coastline to the east of the Base is mapped as having a high to moderate risk of ASS occurring.
Hydrology	HEH-B has a local ridge line along the western boundary of the site. A network of man-made, concrete lined drainage channels traverses the site, generally following the natural topography and exiting the site to the east beyond Murat Road. The majority of surface water run-off from the site therefore ultimately discharges to the coastline. However, a portion goes to the WWTP located on the Base. The area to the east of the Base, inland from the coastline, was observed to drain slowly after heavy rainfall. Areas of standing water were observed in low lying areas. Local surface water flow (including rainfall runoff) is expected to follow the local topography until it is either intersected by stormwater drainage systems on site, infiltrates the sub-surface, or collects at the backwater lagoon east of the Base.
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 in the Quaternary units is considered to be perched and discontinuous. The coastal dunes may also contain relatively fresh groundwater but of limited extent (lenses). ▪ **Groundwater Occurrence/Quality** – The site consists of the following multi-layered aquifer system comprising of the following: – Exmouth North – Carnarvon Cape Range Limestone (unconfined) – Exmouth North Saline Resource – Birdrong

Setting	Description
	Recharge of the aquifers occurs through direct recharge from rainfall infiltration, and indirect recharge along drainage lines from occasional sea water flooding and stormwater runoff. Hydraulic conductivities in the aquifer are likely to be highly heterogeneous and depend on the permeability of the overlying colluvium in the Quaternary sediments, and the degree of fracturing and connectivity of fractures in the deeper limestone.
Hydrogeology (continued)	Groundwater salinity in the region is a result of the relationship between rainfall recharge, extraction, groundwater through flow and the intrusion of a salt water lens into the aquifer. The interface between the low and high salinity groundwater is considered to be diffuse and approximately 1 to 20 metres in thickness. Anecdotal advice suggests the presence of a fresh water body overlying the saline wedge. ▪ **Depth to Groundwater** –During the June 2021 event depth to groundwater was recorded beneath the site at levels of between 1.695 m below top of casing (bTOC) at MW130 and 9.63 mbgl at MW143, with groundwater elevations recorded between -0.0905 mAHD (MW133) and 1.917 mAHD (MW109). Figure 4, Appendix A. Groundwater depth is known to be influenced by tidal variations. ▪ **Groundwater Flow Direction** – Regional groundwater on the Cape Range is likely to flow in a radial pattern from the range heights towards both east and west coasts. The results of the June 2021 gauging event indicated that the inferred groundwater flow direction was to the east, towards the Exmouth Gulf. Previous investigations reported a low hydraulic gradient for the site. ▪ **Groundwater Use** –A number of unregistered extraction bores are understood to be present at residential properties within the township of Exmouth, located approximately 4.0 km south of the site. DWER groundwater database indicates two extraction licences (with one bore each) allocated to two properties approximately 480 m northwest of the northern HEH-B boundary. Seven registered groundwater bores were shown to be present approximately 7.2 km northwest of the northern site boundary. A borefield, comprising 16 potable water supply bores, is located approximately 2.0 to 3.0 km southwest of HEH-B. Groundwater is extracted from the Cape Range aquifer and pumped via underground pipelines to a water treatment plant (WTP). ▪ **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 870 m southwest of the site at its closest point. Priority 1 areas are usually undeveloped and under state management. ▪ **Receiving Surface Water Body** – Beneath the majority of the site, groundwater is generally moving in an easterly direction towards the Exmouth Gulf.
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 7.0 km to the southwest of the site at its closest point. ▪ The Bundegi Conservation Reserve is adjacent to the northeast of the site. ▪ The Ningaloo Coast, a World Heritage listed site is located within 10km of HEHB. 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

A total of 11 Source Areas were identified during the Detailed Site Investigation where PFAS was detected in soil and/or groundwater (GHD, 2018). Table 2-4 summarises the most impacted areas (Figure 2, Appendix A).

Table 2-4 HEH-B Source Areas

Location	Source Area
Source Area North (on-site)	▪ Area 02 – KC Hardstand Area ▪ Area 03 – Fire Department Training Area ▪ Area 07 – Former Landfills ▪ Area 11 – Class IV Landfill
Source Area South (on site)	▪ Area 01 – Former Fire Training Area ▪ Area 04 – Fire Extinguisher Training Area ▪ Area 05 – Building 380 (Warehouse) ▪ Area 06 – Operational Fire Station ▪ Area 08 – Possible former fire training and AFFF Storage Area (Pre-1992) ▪ Area 09 – Former Fire Fighting Facility
Source Area South (off site)	▪ Area 10 – Waste Water Treatment Plant (WWTP)

PFAS concentrations in surface soils were highest in the source areas. The concentrations of PFAS did not exceed the screening criteria for protection of human health but exceeded the ecological screening criteria in a number of investigation areas (GHD, 2018).

It is likely that the concrete/asphalt of the KC Hardstand (Area 02) and the Fire Station driveway (Area 06) are acting as ongoing sources of PFAS to sub-surface soils and groundwater via leachate.

Estimates indicated that the greatest mass of PFAS remains in the soil and groundwater in the former Fire Training Areas (Areas 01, 04 and 08).

3 Sampling and Analytical Methodology

3.1 November 2020 – October 2021 Sampling Dates

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

Table 3-1 Summary of Sampling Dates

Sampling event	OMP Activity	Sampling Period
November 2020 monitoring	Groundwater monitoring (sampling and gauging)	19th to 21st November 2020
	Surface water and sediment sampling	
2021 First flush (March 2021)	Surface water and sediment sampling	3rd March 2021
June 2021 monitoring	Groundwater monitoring (sampling and gauging)	21st to 22nd June 2021
	Surface water and sediment sampling	

3.2 Groundwater Sampling

Sampling of selected groundwater monitoring locations was performed in accordance with the SAQP (Cardno 2021a, Appendix B), applying methods set out in Section 6.2.3 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
On-site – Source Area South	MW310, MW311, MW315, MW103D, MW113, MW115, MW142, MW143
Off-site – Source Area South	MW135, MW122, MW126, MW144S
On-site – Source Area North	MW326, MW105S, MW109, MW145
Off-site – Source Area North	MW134, MW147, MW148S
Off-site – Pathway 1	MW151S, MW152S, MW153S, MW154S, MW137, MW155S
Off-site – Pathway 2	MW118D, MW133, MW022
Off-site – Receptor A	MW128, MW129, MW130, MW131, MW132

3.3 Seepage water Sampling

Seepage water monitoring and sampling was conducted in accordance with the SAQP (Cardno 2021a, 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
Off-site Receptor C	OTH101, OTH102, OTH103, OTH104, OTH105, OTH106

3.4 Surface Water Sampling

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP (Cardno 2021a, 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
Off-site Pathway 2	SW164, SW165, SW167, SW169, SW171, SW173, SW179, SW181,
Off-site Receptor B	SW161, SW162, SW163

3.5 Sediment Sampling

Sampling of selected sediment monitoring locations was performed in accordance with the SAQP (Cardno 2021a, Appendix B), applying methods set out in Section 6.3.4 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
Off-site – Pathway 2	SS164, SD181, SS165, SS167, SS169, SS171, SS173, SS179
Off-site – Receptor B	SS161, SS162, SS163
Note: Sediment is considered to be wet material and is denoted by "SD" while dry material is considered to be surface soil or "SS".	

3.6 Deviations from the OMP SAQP

Deviations from the SAQP for the November 2020 – October 2021 monitoring period are summarised in Table 3-6.

Table 3-6 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
November 2020		
MW105S	Not sampled	This groundwater monitoring bore (on-site Source Area North) was found dry.
MW022		This groundwater monitoring bore (Pathway 2) was unable to be sampled as it was locked at the time of sampling.
MW126		This groundwater monitoring bore (off-site Source Area South) was unable to be accessed at the time of sampling due to asbestos removal works occurring nearby.
SW161, SW162, SW163, SW164, SW165, SW167, SW169, SW171, SW173, SW179		These sampling locations (Pathway 2 & Receptor B) were found dry.
First Flush (March) 2021		
SW161, SW165, SW167, SW169, SW171, SW173, SW179	Not sampled	These locations (Pathway 2 & Receptor B) were found dry.
June 2021		
SW164, SW165, SW167, SW169, SW171, SW173, SW179	Not Sampled	These sampling locations (Pathway 2) were found dry.
MW129, MW132	Dissolved Organic Carbon (DOC) not analysed	These monitoring wells (Receptor A) had insufficient volume of water to filter and fill DOC vial.
MW128	DOC not analysed	Sample (Receptor A) was unable to be filtered and was analysed for total organic carbon (TOC) instead.

3.7 Changes to the Monitoring Network Condition

Monitoring bore MW022 was locked during the November 2020 monitoring event and was unable to be sampled, however was unlocked prior to the following sampling event. No other changes to the monitoring network condition were noted for the November 2020 – October 2021 monitoring 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 the Quality Assurance/Quality Control (QA/QC) aspects was completed during the November 2020, First Flush (March 2021) and June 2021 monitoring events and are included within the factual reports presented 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 seepage water and sediment assessment is considered valid and complete.

5 Assessment Criteria

5.1 Groundwater, Seepage water 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 findings from previous site assessment [i.e. DSI (GHD 2018)]. The adopted assessment criteria for groundwater, seepage water and surface water are detailed in Table 5-1.

Table 5-1 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).

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, 2021a), 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-site 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 was utilised to form the basis of the interpretations and conclusions presented in this report

6.2 Remediation and Infrastructure Projects

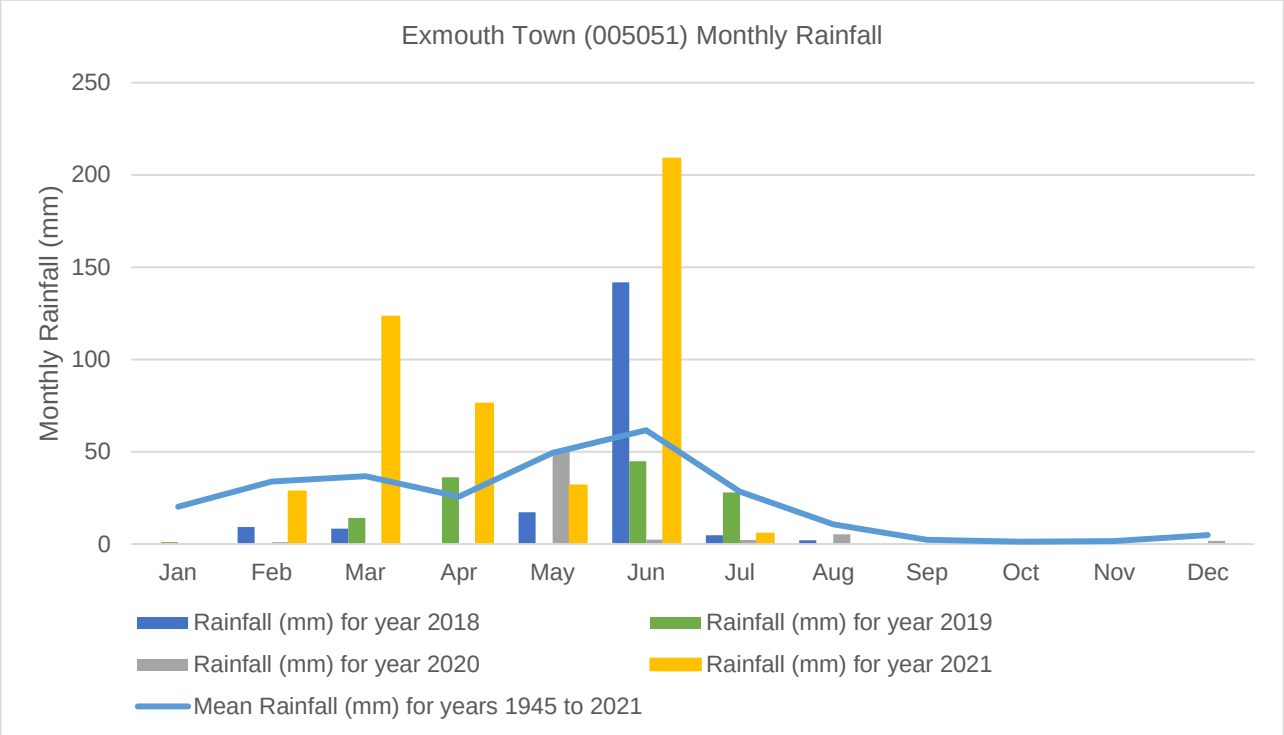
No remediation project or infrastructure works that could affect the interpretation of monitoring results were undertaken at the site during the monitoring period.

6.3 Climate

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

The November 2020 – October 2021 monthly rainfall amounts were generally below average, with the exception of March, April and June, which reported higher than average rainfall amounts.

Figure 6-1 Monthly rainfall and long term mean monthly rainfall for Exmouth Town (station 005051) (BoM, 2020)



No rainfall occurred during the November 2020 monitoring event, however approximately 3.4 mm of rain was reported on the 21st and 22nd of June 2021, during the monitoring event. This was minimal compared with the rainfall reported on the 3rd of March during the first flush monitoring event, which reported 68.6 mm. It is noted the first flush event was triggered by rainfall the day before on the 2nd of March, with the Exmouth Town weather station (Station No. 005051) reporting 85.8 mm of rain. Field observations during the first flush monitoring event confirmed flooding in the area.

7 Monitoring Data Summary

The November 2020, first flush (March 2021) and June 2021 monitoring results are presented within the factual reports provided in Appendix C.

7.1 Groundwater

7.1.1 Groundwater geochemical parameters

Groundwater geochemical parameters recorded 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
Dissolved Oxygen (DO)	0.36 mg/L (MW151S) – 6.73 mg/L (MW315) *Aerobic conditions*	0.75 mg/L (MW113) – 8.48 mg/L (MW126) *Aerobic conditions*
Electrical Conductivity (EC)	1,360 µS/cm (MW311) – 66,778 µS/cm (MW128)	35.983 µS/cm (MW148S) – 56,175 µS/cm (MW129)
Total Dissolved Solids (TDS)	884 mg/L (MW311) – 43,405.7 mg/L (MW128) *Fresh to highly saline water*	23.39 mg/L (MW148S) – 36,513.75 mg/L (MW129) *Fresh to highly saline water*
pH	4.2 (MW132) – 9 (MW315) *Slight acidic to slightly alkaline conditions.*	7.0 (MW142 & MW326) – 8.82 (MW131) *Neutral conditions.*
Oxidation-Reduction Potential (ORP)	-204.1 mV (MW137) – 237.2 mV (MW132) *Reducing to oxidising groundwater conditions.*	-181.1 mV (MW115) – 166.5 mV (MW310) *Reducing to oxidising groundwater conditions.*

The geochemical parameters were generally within the historical ranges recorded for the site. No seasonal variability was observed.

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 the factual reports in Appendix C. Figures 4A and 4B, Appendix A, present the inferred groundwater contours for the November 2020 and June 2021 monitoring events.

Table 7-2 Groundwater Levels and Flow Direction

Item	November 2020	June 2021
Depth to groundwater	2.05 mbTOC (MW133) – 10.07 mbTOC (MW143)	1.69 mbTOC (MW130) – 9.63 mbTOC (MW143)
Groundwater elevation	-0.91 mAHD (MW130) – 1.13 mAHD (MW118D)	0.09 mAHD (MW133) – 1.91 mAHD (MW109)
Inferred direction of groundwater flow	For both monitoring events the groundwater was interpreted to be flowing easterly toward the Exmouth Gulf. In November 2020 some mounding was noted to occur beneath the site and sand dunes to the east, which could create local variations. In June 2021, a western flow direction was also reported in the western portion of the site.	
Seasonal difference in groundwater elevation	Groundwater levels were on average 0.61 m deeper during the November 2020 event than during the June 2021 event.	

Groundwater elevations and flow direction for the monitoring 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.

7.1.3 On-site and off-site Source Areas Summary Results

As indicated on Figure 2 of Appendix A, the Source Areas consist of:

- Source Area North: Area 02 (KC Hardstand Area), Area 03 (Fire Department Training Area), Area 07 (Former Landfills) and Area 11 (Class IV Landfill)
- Source Area South: Area 01 (Former Fire Training Area), Area 04 (Fire Extinguisher Training Area), Area 05 (Building 380), Area 06 (Fire Station), Area 08 (Possible AFF Storage and Training Area), Area 09 (Former Fire Training Facility) and Area 10 (Wastewater Treatment Plant).
- Area 10 (the WWTP) is located off-site, while all other source areas are located on-site.

7.1.3.1 Source Area North

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

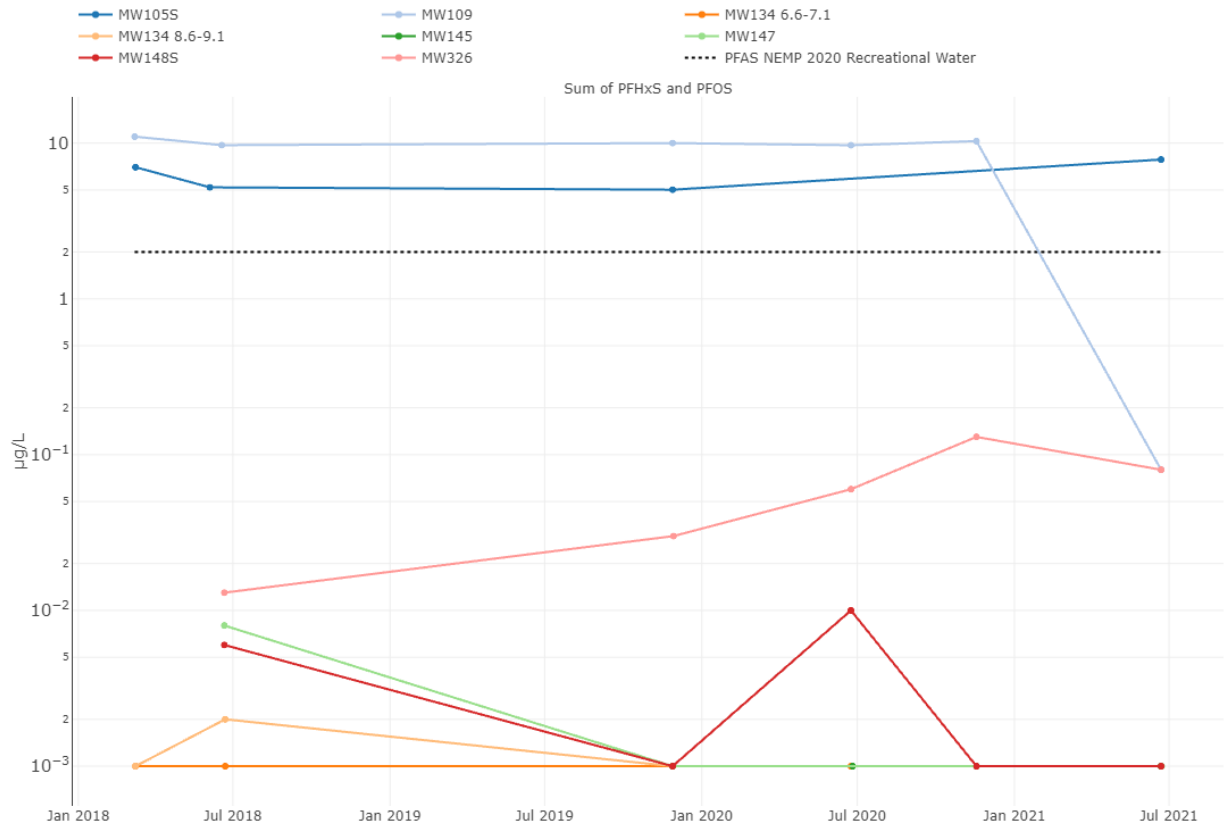
Table 7-3 Source Area North Sum of PFOS and PFHxS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW105S	PFOS and PFHxS	5.2 – 7.0	NS	7.84
	PFOA	0.13 – 0.18		0.33
MW109	PFOS and PFHxS	9.7 – 11.0	10.30	0.08
	PFOA	0.14 – 0.20	0.18	<0.01
MW134	PFOS and PFHxS	<0.001 – 0.002	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW145	PFOS and PFHxS	<0.01 - 2.59	<0.01	<0.01
	PFOA	<0.01 - 0.12	<0.01	<0.01
MW147	PFOS and PFHxS	<0.01 - 0.008	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW148	PFOS and PFHxS	<0.01 - 0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW326	PFOS and PFHxS	0.013 – 0.06	0.13	0.08
	PFOA	<0.01 – 0.004	<0.01	0.02
New Maximum		New Minimum	New Exceedance	

Notes:
NS – Not sampled
MW000 – multilevel well

The highest PFOA concentrations was recorded at MW105S located within the Former Landfill in June 2021 (0.33 µg/L), and the highest Sum of PFHxS and PFOS concentration was recorded at MW109, located in the Fire Training Area (FTA) in November 2020 (10.3 µg/L).

Figure 7-1 Source Area North Sum of PFOS and PFHxS, Concentration 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.

7.1.3.2 Source Area South

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

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

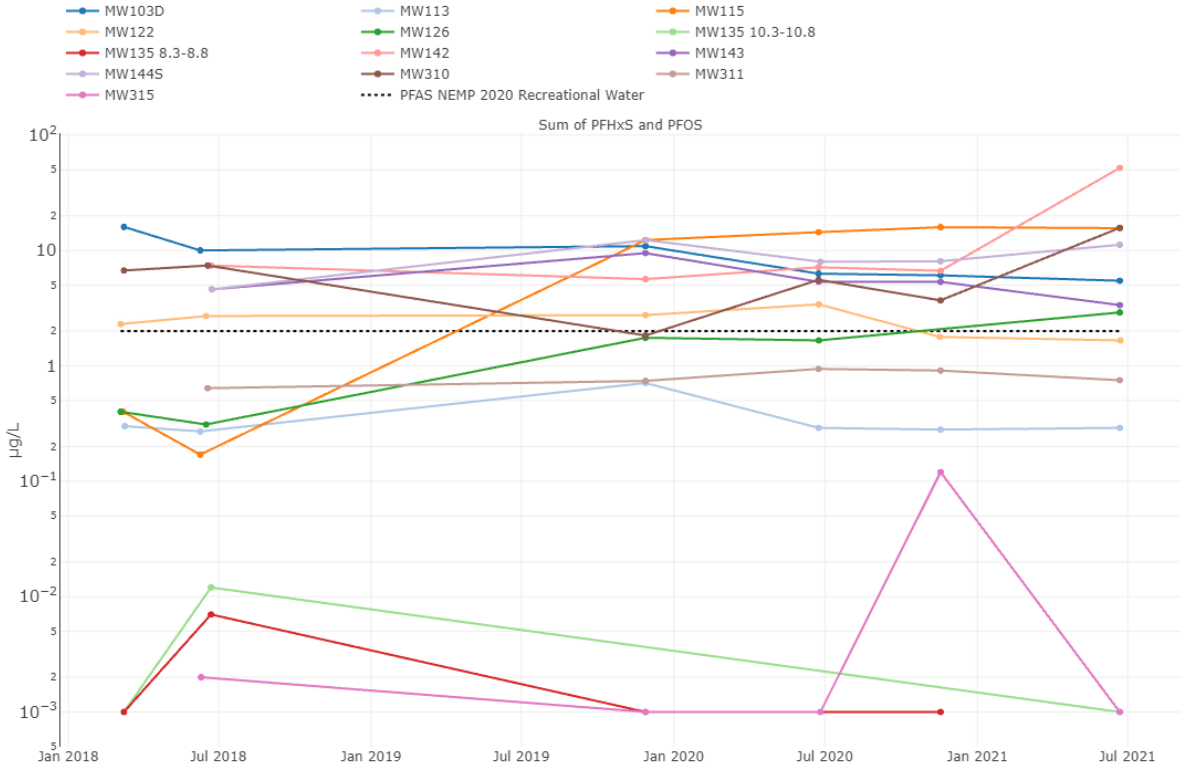
Location ID	Analyte	Historical range	OMP Monitoring Event	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW103D	PFOS and PFHxS	6.29 - 16	6.08	5.46
	PFOA	0.09 – 0.14	0.08	0.08
MW113	PFOS and PFHxS	0.27 – 0.71	0.28	0.29
	PFOA	<0.01 – 0.01	<0.01	<0.01
MW115	PFOS and PFHxS	0.17 – 14.40	15.90	15.60
	PFOA	0.12 – 0.68	0.55	0.53
MW122	PFOS and PFHxS	2.30 – 3.41	1.78	1.66
	PFOA	0.12 – 0.29	0.16	0.12
MW126	PFOS and PFHxS	0.31 – 1.75	NS	2.90
	PFOA	0.05 – 0.13		0.16
MW135	PFOS and PFHxS	<0.01 – 0.012	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW142	PFOS and PFHxS	5.64 - 7.4	6.66	51.90
	PFOA	0.27 - 0.59	0.14	0.74
MW143	PFOS and PFHxS	4.6 – 9.48	5.34	3.36
	PFOA	0.39 - 0.47	0.37	0.30
MW144S	PFOS and PFHxS	4.6 – 12.30	8.06	11.2
	PFOA	0.55 - 0.66	0.58	0.95
MW310	PFOS and PFHxS	1.83 - 7.40	3.69	15.70
	PFOA	0.07 – 0.17	0.12	0.34
MW311	PFOS and PFHxS	0.64 – 0.94	0.91	0.75
	PFOA	0.03 – 0.06	0.05	0.08
MW315	PFOS and PFHxS	<0.001 – 0.002	<0.01	0.12
	PFOA	0.001 – 0.002	<0.01	<0.01

New Maximum | New Minimum | New Exceedance

Note:
MW000 – multilevel well

The highest PFOA concentration was recorded at MW144, located near the WWTP in June 2021 (0.95 µg/L) and the highest Sum of PFHxS and PFOS concentration was recorded at MW142, located near the Fire Station in June 2021 (51.9 µg/L). A number of monitoring wells recorded new maximums of Sum of PFOS and PFHxS during June 2021, amongst those, MW142, MW310 and MW315 recorded new maximums one order of magnitude above historical range.

Figure 7-2 Source Area South Sum of PFOS and PFHxS, Concentration 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.

7.1.4 Off-site Pathways and Receptors

The off-site pathways and receptors are presented in Figure 2 of Appendix A and include:

- Pathway 1, groundwater flow to the east of the source area north;
- Pathway 2, groundwater flow along the drainage channel to the east of source area south; and
- Receptor A, located along the coastline.

7.1.4.1 Pathway 1

A summary of the PFOA and the Sum of PFOS and PFHxS concentrations for the monitoring period and the historical concentration ranges for the Pathway 1 monitoring locations are presented in Table 7-5 and the concentrations are presented on Figure 7-3. Note that locations MW151S, MW152S and MW155S present the same concentrations over time in Figure 7-3.

Table 7-5 Pathway 1 Area Sum of PFOS and PFHxS, and PFOA Concentrations

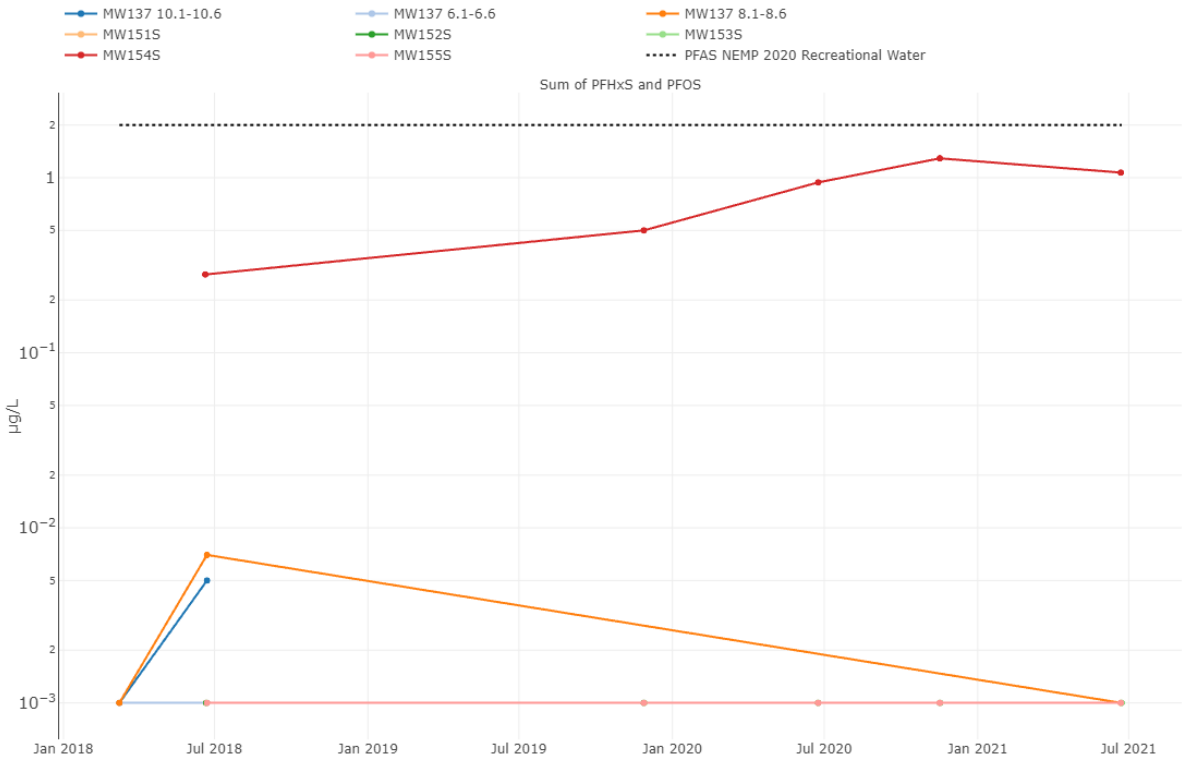
Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW137	PFOS and PFHxS	<0.001 – 0.001	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW151S	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW152S	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW153S	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW154S	PFOS and PFHxS	0.28 – 0.94	1.29	1.07

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW155S	PFOA	0.02 - 0.05	0.05	0.05
	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Note:
MW000 – multilevel well

The highest PFOA (0.05 µg/L) and Sum of PFOS and PFHxS (1.29 µg/L) concentrations were recorded in MW154S (November 2020). All PFAS concentrations were recorded below the adopted assessment criteria, with the exception of PFOS concentrations for MW154S. In both monitoring events concentrations of PFOS were reported above the adopted ecological criteria (99% species protection level for fresh and marine water) of the laboratory LOR.

Figure 7-3 Pathway 1 Sum of PFHxS and PFOS, concentration 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.

7.1.4.2 Pathway 2

A summary of the PFOA and the Sum of PFOS and PFHxS concentrations for the monitoring period and the historical concentration ranges for the Pathway 2 monitoring locations are presented in Table 7-6, with the Sum of PFOS and PFHxS concentrations plotted on Figure 7-4.

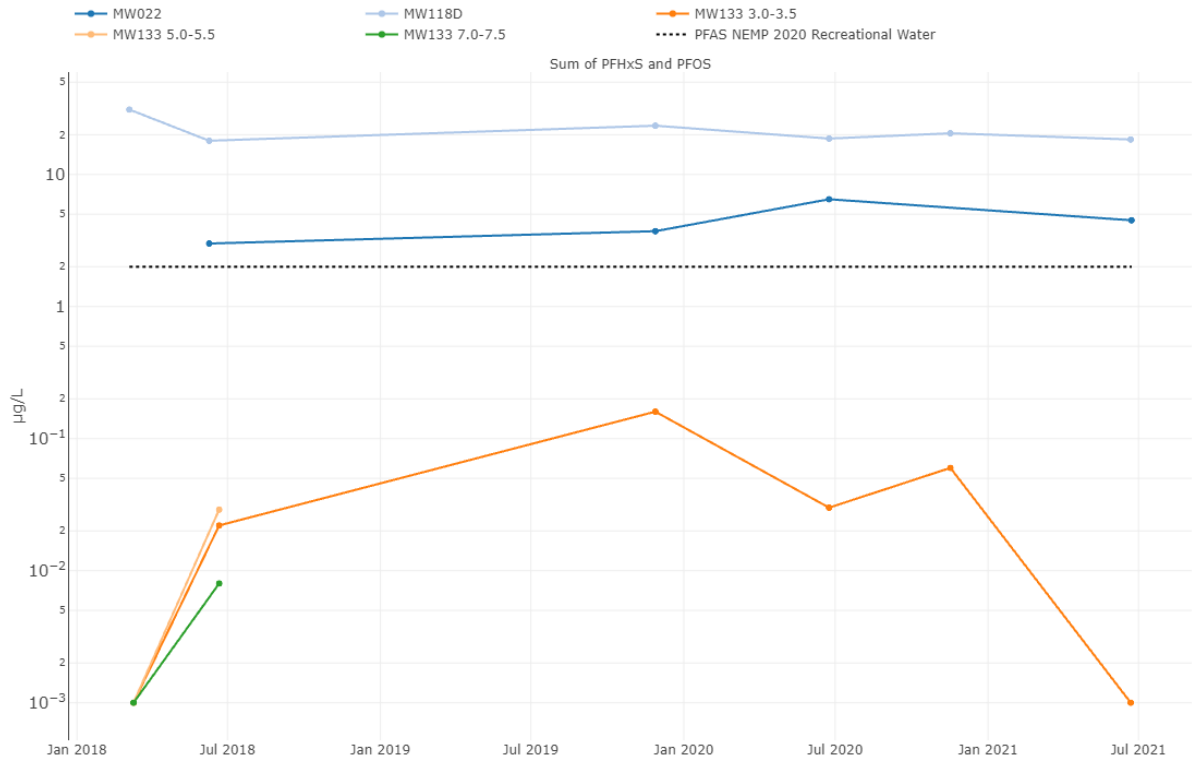
Table 7-6 Pathway 2 Sum of PFOS and PFHxS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW022	PFOS and PFHxS	3.0 – 6.49	NS	4.50
	PFOA	0.32 – 0.81		0.56
MW118D	PFOS and PFHxS	18.0 – 31.0	20.5	18.40
	PFOA	1.23 – 1.8	1.10	1.24
MW133	PFOS and PFHxS	<0.001 - 0.16	0.06	<0.01
	PFOA	0.002 – 0.006	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Notes:
NS – Not sampled
MW000 – multilevel well

The highest PFOA concentration was recorded in MW118D, located off-site within the Fire Station in June 2021 (1.24 µg/L). The highest Sum of PFHxS and PFOS concentration was recorded at MW118D in November 2020 (20.5 µg/L).

Figure 7-4 Pathway 2 Sum of PFOS and PFHxS, Concentration 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.

7.1.4.3 Receptor A

A summary of the PFOA and the Sum of PFOS and PFHxS concentrations for the monitoring period and the historical concentration ranges for the Receptor A 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.

Table 7-7 Receptor A Sum of PFOS and PFHxS, and PFOA Concentrations

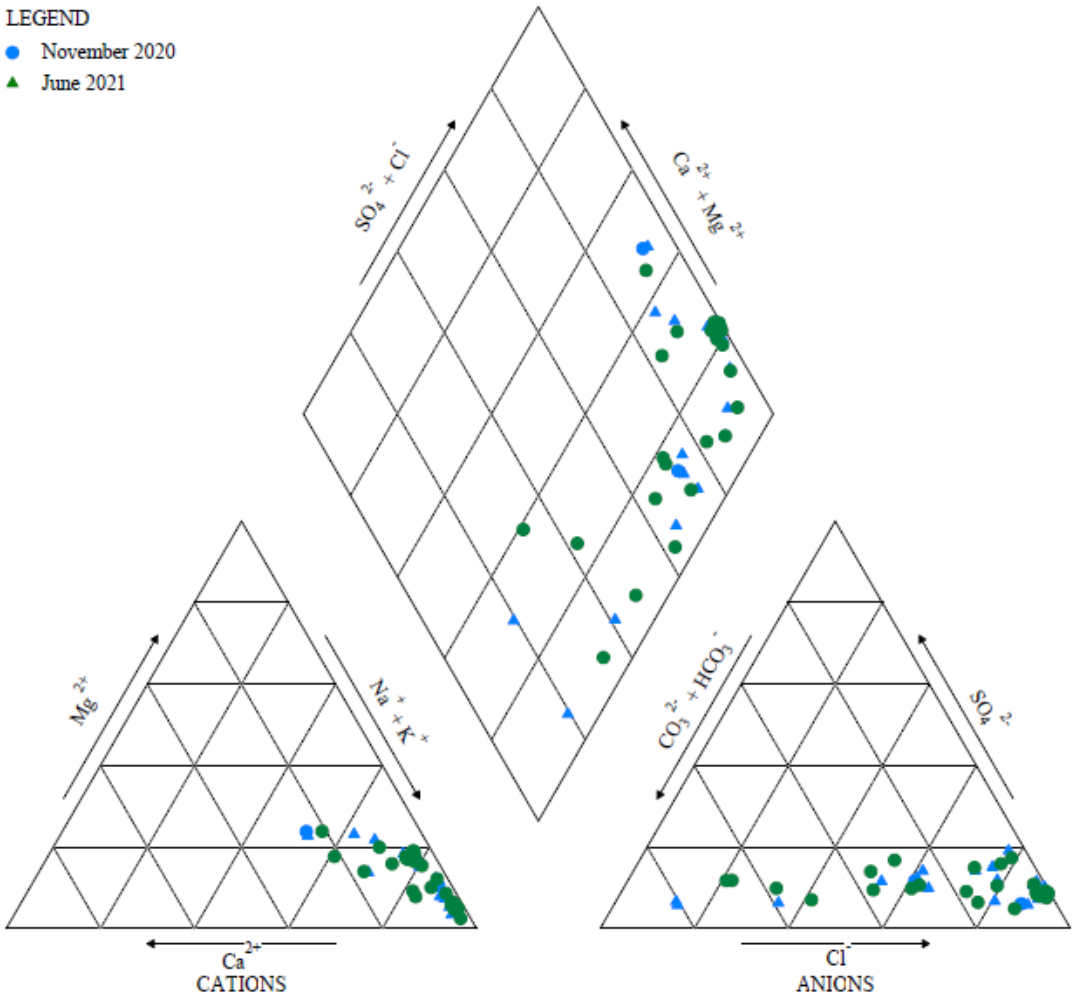
Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW128	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 – 0.001	<0.01	<0.01
MW129	PFOS and PFHxS	<0.001 - <0.01	<0.01	<0.01
	PFOA	<0.001 - <0.01	<0.01	<0.01
MW130	PFOS and PFHxS	<0.001 – 0.16	0.02	0.02
	PFOA	<0.001 – 0.002	<0.01	<0.01
MW131	PFOS and PFHxS	<0.001	0.02	<0.01
	PFOA	<0.001	<0.01	<0.01
MW132	PFOS and PFHxS	<0.001 – 0.05	0.04	<0.01
	PFOA	0.008 – 0.025	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

The highest Sum of PFOS and PFHxS concentrations were recorded in MW132, located off-site within Receptor A in November 2020 (0.04 µg/L). All PFOA concentrations for Receptor A were recorded below laboratory LOR. All PFAS concentrations were recorded below the adopted assessment criteria at the other locations within Receptor A.

7.1.5 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 7-5. Groundwater hydrochemistry is consistent between each sampling event. Majority of groundwater samples plot in the sodium chloride groundwater type as well as calcium-sodium-bicarbonate and sodium-bicarbonate types. The variation observed in water chemistry appear to be related to the water salinity and proximity to the coastline (i.e. effect of seawater ingress).

Figure 7-5 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 within the factual reports in Appendix C.

Table 7-8 Seepage water Geochemical Parameters

Parameter	November 2020	June 2021
DO	3.91 mg/L (OTH105) – 4.15 mg/L (OTH104) *Aerobic conditions.*	3.77 mg/L (OTH106) – 5.37 mg/L (OTH101) *Aerobic conditions.*
EC	62,149 µS/cm (OTH103) – 65,705 µS/cm (OTH102)	28,534 µS/cm (OTH104) – 56,048 µS/cm (OTH103)
TDS	40,396.8 mg/L (OTH103) – 42,708.2 mg/L (OTH102) *Highly saline conditions.*	18,547 mg/L (OTH104) – 36,431 mg/L (OTH103) *Highly saline conditions.*
pH	4.42 (OTH104) – 7.44 (OTH106) *Slightly acidic to neutral conditions.*	7.33 (OTH106) – 7.95 (OTH103) *Neutral conditions.*
ORP	-7.6 mV (OTH105) – 246.3 mV (OTH104) *Reducing to oxidising conditions.*	91.8 mV (OTH101) – 126.3 mV (OTH104) *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, downgradient of the identified source areas, including water discharged to the Exmouth Gulf. Here, receptors include sea life of the Exmouth Gulf, in particular prawns.

Seepage water has been sampled since February 2018 during an outgoing tide. Detects of PFOS and the Sum of PFOS and PFHxS have been recorded within isolated sampling locations during this period. No detects of PFOA or Sum of PFOS and PFHxS were recorded during this monitoring period, with all results below the laboratory LOR.

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the monitoring 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 below laboratory LOR and therefore the results have not been plotted.

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

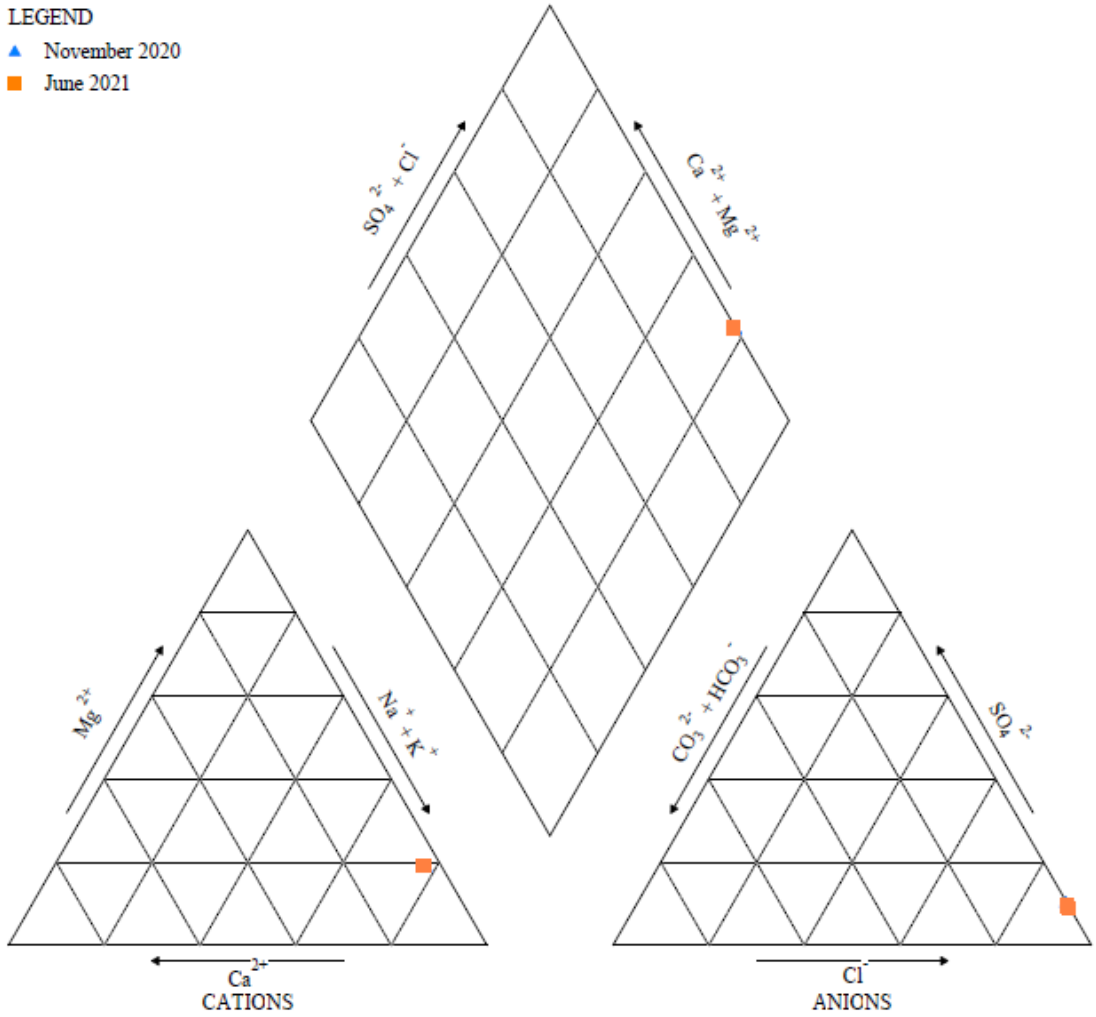
Location ID	Analyte	Historical range	OMP Monitoring Event	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
OTH101	PFOS and PFHxS	<0.001	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH102	PFOS and PFHxS	<0.001 – 0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH103	PFOS and PFHxS	<0.001	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH104	PFOS and PFHxS	<0.001	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH105	PFOS and PFHxS	<0.001 – 0.004	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH106	PFOS and PFHxS	<0.001 – 0.002	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01

New Maximum | New Minimum | New Exceedance

7.2.3 Major Ions Analysis

Major ions analysis was conducted on the seepage 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 7-6. Seepage water hydrochemistry is consistent between each sampling event and across the monitoring locations. All seepage water samples plot in the sodium chloride groundwater type.

Figure 7-6 Piper Diagram – Seepage water samples



7.3 Surface Water

7.3.1 Surface water geochemical parameters

Surface water geochemical parameters recorded during the first flush and June 2021 monitoring events are summarised in Table 7-10 and provided within the factual reports in Appendix C.

Table 7-10 Surface water Geochemical Parameters

Parameter	First Flush (March) 2021	June 2021
DO	1.13 mg/L (SW163) – 4.21 mg/L (SW181) *Aerobic conditions.*	2.44 mg/L (SW181) – 5.38 mg/L (SW162) *Aerobic conditions.*
EC	42,812 µS/cm (SW161) – 70,491 µS/cm (SW181)	10,432 µS/cm (SW162) – 55,900 µS/cm (SW181)
TDS	27,827.8 mg/L (SW161) – 45,819.1 mg/L (SW181) *highly saline conditions.*	6,780.8 mg/L (SW162) – 36,335 mg/L (SW181) *Saline to highly saline conditions.*
pH	7.56 (SW163) – 8.26 (SW181) *Neutral conditions*	7.64 (SW181) – 8.0 (SW161) *Neutral conditions.*
ORP	72.3 mV (SW163) – 103.6 mV (SW181) *Oxidising conditions*	80.2 mV (SW161) – 109.1 mV (SW162) *Oxidising conditions.*

Note: Not enough surface water data was collected during the November 2020 event to present a range of parameters.

7.3.2 Surface water results summary

Surface water is sampled across the Pathway 2 and Receptor B Areas to assess PFAS concentrations in surface water.

Surface water has been sampled since February 2018. In addition, to the November 2020 and June 2021 biannual monitoring events a first flush event was also undertaken in March 2021.

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the monitoring period and the historical concentration ranges for the surface water monitoring locations are presented in Table 7-11. It is noted that a number of the sample locations were dry, or concentrations recorded below the laboratory LOR during the monitoring events and therefore the results have not been plotted.

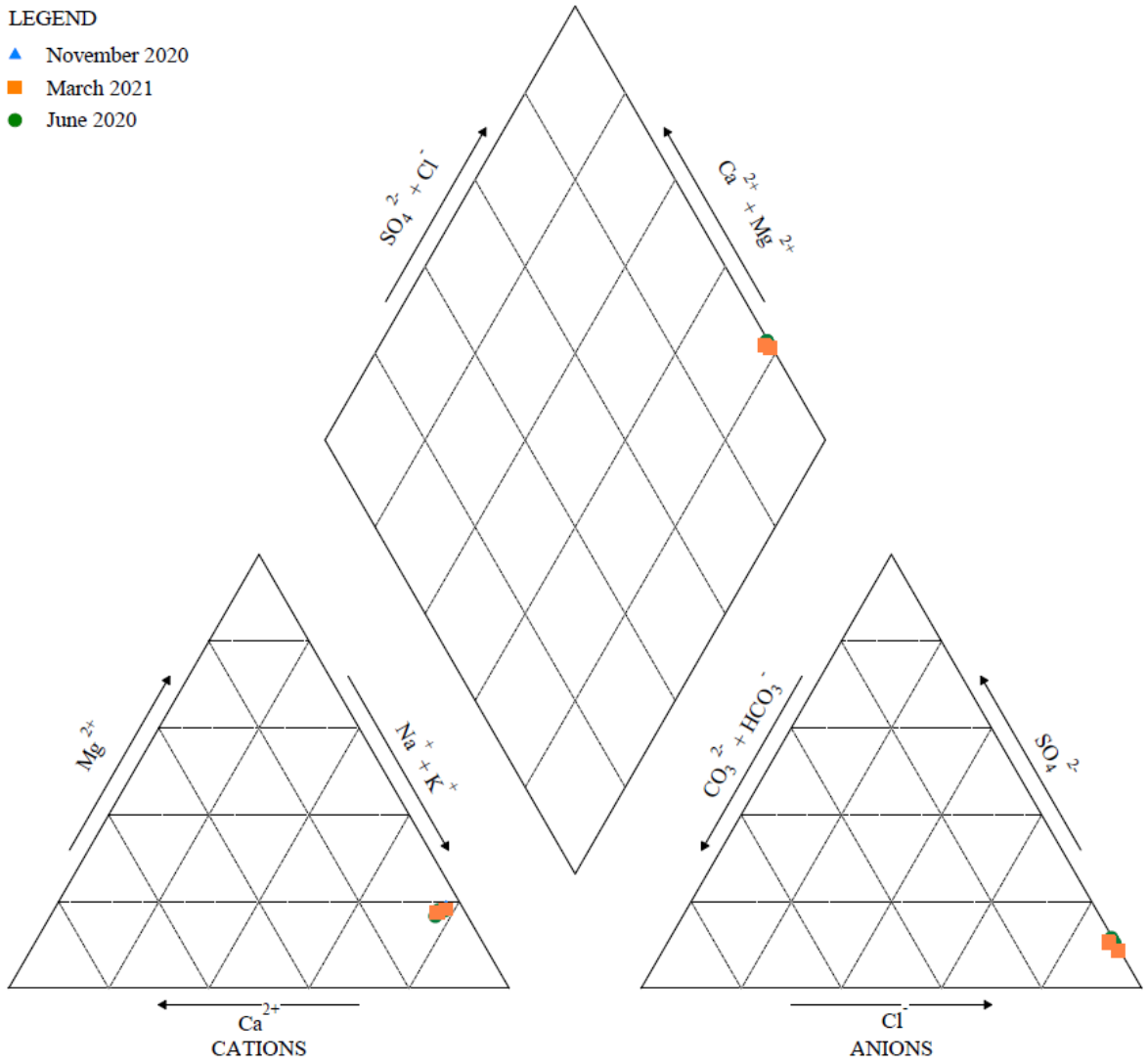
Table 7-11 Surface Water Sum of PFHxS and PFOS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring Event		
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
SW161	PFOS and PFHxS	<0.001 – 0.008	Dry	<0.01	<0.01
	PFOA	<0.001		<0.01	<0.01
SW162	PFOS and PFHxS	<0.001 – 0.003	Dry	<0.01	<0.01
	PFOA	<0.001		<0.01	<0.01
SW163	PFOS and PFHxS	<0.001 – 0.008	Dry	<0.01	<0.01
	PFOA	<0.001		<0.01	<0.01
SW164	PFOS and PFHxS	0.04 – 0.20	Dry	Dry	Dry
	PFOA	0.003 – 0.01			
SW181	PFOS and PFHxS	<0.01 - 0.005	<0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW165	PFOS and PFHxS	Dry	Dry	Dry	Dry
	PFOA				
SW179	PFOS and PFHxS	Dry	Dry	Dry	Dry
	PFOA				
SW167	PFOS and PFHxS	Dry	Dry	Dry	Dry
	PFOA				
SW169	PFOS and PFHxS	Dry	Dry	Dry	Dry
	PFOA				
SW171	PFOS and PFHxS	Dry	Dry	Dry	Dry
	PFOA				
SW173	PFOS and PFHxS	Dry	Dry	Dry	Dry
	PFOA				
New Maximum		New Minimum		New Exceedance	

7.3.3 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 7-7. The samples all plot in the sodium chloride water type, which is consistent with the observations on groundwater and supports the interpretation of groundwater recharging through surface water infiltration.

Figure 7-7 Piper Diagram - Surface water samples



7.4 Sediment

A summary of the PFOA and Sum of PFOS and PFHxS concentrations for the monitoring period and the historical concentration ranges for the sediment sampling locations are presented in Table 7-12. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted.

Table 7-12 Sediment Sum of PFHxS and PFOS, and PFOA Concentrations

Location ID	Analyte	Historical range	OMP Monitoring Event		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SS161	PFOS and PFHxS	<0.0001	<0.0001	<0.0002	<0.0002
	PFOA	<0.0001	<0.0001	<0.0002	<0.0002
SS162	PFOS and PFHxS	<0.0001	<0.0001	<0.0002	<0.0002
	PFOA	<0.0001	<0.0001	<0.0002	<0.0002
SS163	PFOS and PFHxS	<0.0001	<0.0001	<0.0002	<0.0002
	PFOA	<0.0001	<0.0001	<0.0002	<0.0002
SS164	PFOS and PFHxS	0.001 – 0.0046	0.0345	0.0099	0.0034
	PFOA	<0.0001 – 0.0002	0.0004	<0.0002	<0.0002
SS165	PFOS and PFHxS	0.0024 – 0.0058	0.0091	0.0012	0.0005
	PFOA	<0.0002 - 0.0003	0.0005	<0.0002	<0.0002
SS167	PFOS and PFHxS	0.0005 – 0.0022	0.0024	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS169	PFOS and PFHxS	<0.0001 – 0.0006	0.0016	0.0004	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS171	PFOS and PFHxS	<0.0001 – 0.0016	<0.0002	0.0026	0.0056
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS173	PFOS and PFHxS	0.0003 – 0.0008	0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS179	PFOS and PFHxS	<0.0001	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS181	PFOS and PFHxS	<0.0001 – 0.0001	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002

New Maximum | New Minimum | New Exceedance

8 Interpretive Analysis

This section discusses the results of the biannual and first flush monitoring events conducted between November 2020 and October 2021. The findings of the groundwater, seepage water, surface water and sediment sampling are summarised in the following sections and results are displayed in Appendix A:

- Figure 5 for the November 2020 biannual event;
- Figure 6 for the March 2021 (first flush) event; and
- Figure 7 for the June 2021 biannual event.

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). 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, as in "decreasing" vs. "probably decreasing" or "increasing" vs. "probably increasing". When CF>95%, the data demonstrate a strong trend. When the CF falls between 90 to 95% the qualifier "Probably" is applied due to the lower confidence.
- 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 (i.e. when CF <90%).

8.1 Groundwater

All monitoring wells were gauged during both OMP groundwater monitoring events (GMEs). Groundwater flow direction is consistent between the two GMEs and the DSI, indicating a generally consistent groundwater flow direction from the site infrastructure towards the Indian Ocean, to the east. However, during the June 2021 GME a westerly groundwater flow direction was interpreted for the westernmost area of the site. 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.

The major ions analysis indicates that the groundwater is linked to the surface water through infiltration and seepage water as majority of wells share the same water type (sodium chloride).

8.1.1 On-site and off-site Source Areas Summary Results

Generally, the PFAS concentrations for the on-site Source Area monitoring wells were consistent between each GME and historical concentrations. It is noted a significant increase in PFOS and Sum of PFOS and PFHxS concentrations was reported at MW142 (located at the fire station) in June 2021, from a historical average of 7.31 µg/L (Sum of PFOS and PFHxS) between June 2018 and November 2020 to 51.9 µg/L in June 2021. Further monitoring of PFAS at this well is required to confirm whether the concentration observed in June 2021 is an outlier. A significant decrease in PFOA and Sum of PFOS and PFHxS concentrations was observed at monitoring well MW109 in June 2021. As noted in Section 6, the rainfall amounts in the months leading to the June 2021 monitoring event were mostly greater than average. It is possible that freshwater has infiltrated and a lens of freshwater is present under this area. This is correlated by the significant increase in groundwater elevation at this monitoring well.

A number of samples analysed for PFOA, PFOS and the Sum of PFOS and PFHxS have reported concentrations above the respective laboratory LOR, with concentrations of PFOS and the Sum of PFOS and PFHxS recorded above the adopted human health and ecological assessment criteria, as presented in the factual reports data assessment tables.

The highest PFAS concentrations were reported in the wells in the Source Area South in the vicinity of the former Fire Training Areas with wells MW103D, MW115, MW122, MW142, MW143, MW144S and MW310 consistently reporting concentrations for the Sum of PFOS and PFHxS above the HEPA (2020) Recreational Use criteria (see Table 7-4). A first time exceedance of the recreational use criteria was reported for Sum of PFOS and PFHxS at Source Area South monitoring well MW126 in June 2021.

All wells across the Source Area South, with the exception of MW113, MW135 and MW315 recorded PFOA concentrations above the laboratory LOR, but below adopted human health and ecological assessment criteria.

All PFOS concentrations recorded above the laboratory LOR are considered to exceed the HEPA (2020) 99% species protection level for fresh and marine water, as the criterion of 0.00023 µg/L is lower than the laboratory LOR. All wells across the Northern and Southern Source Areas recorded PFOS concentrations above the LOR in November 2020 and June 2021 with the exception of MW134, MW145, MW147 and MW148 from source area north and MW135 from source area south.

The above observations and data obtained during the monitoring period confirm the PFAS impact and source areas identified during the DSI.

Plume stability (Mann Kendall analysis) has been calculated for each well that has sufficient temporal data (i.e. a minimum of four results). Groundwater monitoring data recorded between February 2018 and June 2021 was used for the assessment, with outputs presented in Appendix D. Groundwater monitoring well trends for PFOA and the Sum of PFOS and PFHxS are summarised in Table 8-1.

Table 8-1 Mann-Kendall Trend Analysis Summary – Source Areas North and South

Source Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
Source Area North	MW105S	Stable	37.5	Yes	Stable	37.5	Yes
	MW109	Stable	64	No	Stable	86.4	No
	MW134	Stable	39.3	No	Stable	64	No
	MW135	Stable	40.8	No	No Trend	59.2	No
	MW145	No Trend	75.8	No	No Trend	75.8	No
	MW147	Stable	37.5	No	No Trend	72.9	No
	MW148S	Stable	40.8	No	No Trend	67.5	No
	MW326	No Trend	57.0	Yes	Probably Increasing	93.2	No
Source Area South	MW103D	Decreasing	99.6	No	Decreasing	99.2	No
	MW113	No Trend	89.8	No	Stable	57	No
	MW115	Probably Increasing	93.2	No	Increasing	97.2	No
	MW122	Stable	57.0	No	Stable	64	No
	MW126	Increasing	95.8	Yes	No Trend	88.3	Yes
	MW142	Stable	59.2	Yes	No Trend	59.2	Yes
	MW143	Decreasing	99.2	No	No Trend	75.8	No
	MW144S	No Trend	59.2	Yes	No Trend	75.8	No
	MW310	No Trend	70.3	Yes	No Trend	50	Yes
	MW311	No Trend	88.3	Yes	No Trend	75.8	No
	MW315	Stable	39.3	No	No Trend	57.0	No

The results of the Mann-Kendall trend analysis for PFOA reported a stable or no statistically-significant trend for majority of monitoring wells in both source areas, with exception of the following:

- An increasing trend was observed at MW115 and MW126 (Source Area South).
- A decreasing trend was observed at MW103D and MW143 (Source Area South).

The results of the Mann-Kendall trend analysis for the Sum of PFOS and PFHxS reported a stable or no statistically-significant trend for majority of monitoring wells in both source areas, with exception of the following:

- A probably increasing trend was observed at MW326 (Source Area North) and an increasing trend was reported at MW115 (Source Area South).
- A decreasing trend was observed at MW103D (Source Area South) with a high confidence factor.

No clear evidence on depletion of the source zone can be established at this stage, it is noted that decreasing trends with relatively high confidence factors are observed at some source area monitoring wells. However, new Sum of PFOS and PFHxS concentration maximums were recorded one order of magnitude above historical range at MW315, MW310 and MW142. Further temporal data is required to determine if these are evidence of potential increasing trends and/or plume migration.

Overall, the groundwater monitoring results for majority of monitoring wells do not suggest a change in the understanding of contamination or risk at these locations. Additionally, the current monitoring network is considered adequate to monitor PFAS in groundwater on-site.

8.1.2 Off-site Pathways and Receptors

The PFAS concentrations for the off-site Pathway and Receptor Area monitoring wells are consistent between each GME and historical recorded concentrations.

A number of samples analysed for PFOA, PFOS and the Sum of PFOS and PFHxS have reported concentrations above the respective laboratory LOR, with concentrations of PFOS and the Sum of PFOS and PFHxS recorded above the adopted human health and ecological assessment criteria, as presented in the factual reports data assessment tables.

The highest PFAS concentrations were reported in the wells in the Pathway 2 Area with wells MW022 and MW118D consistently reporting concentrations for the Sum of PFOS and PFHxS above the HEPA (2020) Recreational Use criteria (see Table 7-6).

Only monitoring wells MW022 (Pathway 2), MW118D (Pathway 2) and MW154S (Pathway 1) recorded PFOA concentrations above the laboratory LOR, but below adopted human health and ecological assessment criteria.

All PFOS concentrations recorded above the laboratory LOR are considered to exceed the HEPA (2020) 99% species protection level for fresh and marine water, as the criterion of 0.00023 µg/L is lower than the laboratory LOR. PFOS was recorded above the LOR at MW154S (Pathway 1), MW022, MW118D and MW133 (Pathway 2) and MW130 and MW131 (Receptor A) between November 2020 and October 2021.

Plume stability (Mann Kendall analysis) has been calculated for each well that has sufficient temporal data (i.e. a minimum of four results). Groundwater monitoring data recorded between February 2018 and June 2021 was used for the assessment, with outputs presented in Appendix D. Groundwater monitoring well trends for PFOA and the Sum of PFOS and PFHxS are summarised in Table 8-2.

Table 8-2 Mann-Kendall Trend Analysis Summary – Pathway Areas 1 and 2, and Receptor A

Source Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
Pathway 1	MW137	Stable	39.3	No	No Trend	64	No
	MW151S	Stable	40.8	No	Stable	40.8	No
	MW152S	Stable	40.8	No	Stable	40.8	No
	MW153S	Stable	40.8	No	Stable	40.8	No
	MW154S	No Trend	82.1	No	Increasing	95.8	No
	MW155S	Stable	40.8	No	Stable	40.8	No
Pathway 2	MW022	No Trend	88.3	No	No Trend	59.2	No
	MW118D	Probably Decreasing	93.2	No	Stable	76.5	No
	MW133	Probably Decreasing	93.2	No	No Trend	57	No
Receptor A	MW128	Stable	39.3	No	Stable	39.3	No

Source Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
	MW129	Stable	39.3	No	Stable	39.3	No
	MW130	Stable	59.2	No	No Trend	88.3	No
	MW131	Stable	39.3	No	No Trend	64	No
	MW132	Probably Decreasing	93.2	No	No Trend	50	No

The results of the Mann-Kendall trend analysis for PFOA and Sum of PFOS and PFHxS indicates that the plume generally displays a stable or no statistically significant trend. It is noted a “probably decreasing” trend was reported for PFOA at MW118D, MW133 (Pathway 2) and MW132 (Receptor A).

An increasing trend of Sum of PFOS and PFHxS was reported for MW154S within the Pathway 1 down-gradient of the source areas. During the monitoring period, this monitoring well had recorded Sum of PFOS and PFHxS concentrations above historical range, although by less than one order of magnitude. This potential increase has however not been noted for groundwater monitoring well MW132 and seepage water monitoring location OTH105 further down-gradient. It is possible the plume could be expanding further to the east but is not reaching the coastline or dilution is occurring before PFAS can be detected. This comment is however based on one analyte at one monitoring location and further temporal data is required to confirm.

Overall, the groundwater monitoring results for majority of monitoring wells do not suggest a change in the understanding of contamination or risk at these locations. Additionally, the current monitoring network is considered adequate to monitor PFAS in groundwater off-site and to provide an early detection of significant changes in migration.

8.2 Seepage Water

The PFAS concentrations for seepage water across the sampling locations is consistent between each event and is consistent with historical results.

All locations reported PFAS concentrations below the laboratory LOR during the OMP monitoring events.

No change in PFAS concentrations and distribution in relation to the main aquatic receptors has occurred since the commencement of the OMP.

8.3 Surface Water

The PFAS concentrations for surface water across the sampling locations is consistent between each event and is consistent with historical results. All locations reported PFAS concentrations below the laboratory LOR during the OMP monitoring events.

With the exception of SW164, all locations sampled between November 2020 and October 2021 have been sampled a minimum of four times since February 2018. Mann Kendall analysis has been calculated for the surface water sampling locations. Surface water data recorded between February 2018 and October 2021 was used for the assessment, with outputs presented in Appendix D and a summary provided in Table 8-3 below.

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

Source Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
Receptor B	SW161	Stable	39.3	No	No Trend	75.8	No
	SW162	Stable	39.3	No	Stable	40.8	No
	SW163	Stable	39.3	No	No Trend	75.8	No
Pathway 2	SW181	Stable	39.3	No	No Trend	75.8	No

The results of the Mann-Kendall trend analysis indicate that the PFAS impacted area displays a stable or no statistically significant trend.

The surface water monitoring locations (targeting the drain leaving the site and discharging to the Exmouth Gulf) were observed mostly dry during the monitoring period. Where a sample was able to be taken, PFAS results reported concentrations below the laboratory LOR. Where surface water was present, it was observed pooling in the low-lying areas of the drain and not flowing. No increase in PFAS concentrations was detected in surface water after first flush in March 2021.

8.4 Sediment

Sediment (wet) and surface soil (dry) concentrations across the sampling locations since sampling commenced have predominantly been below the laboratory LOR with the exception of SS164, SS165, SS167, SS169, SS171 and SS173 located within the drain leaving the site(Pathway 2 Area, refer to Table 7-12).

All concentrations were recorded below the adopted human health and ecological assessment criteria with the exception of SS164 (located closest to the site), which reported a first-time exceedance of the ecological assessment criteria for PFOS in November 2020. Given the absence of surface water flow in the main drain (Pathway Area 2) it is considered that PFAS migration with surface water that could result in increased concentrations in sediment would be a very slow process. However, the first exceedance at SS164 indicates that PFAS is leaving the site through this run-off migration pathway in some extent.

It is considered the sediment sampling locations are adequately positioned to assess changes in surface water runoff and resulting sediment impacts.

9 Conceptual Site Model

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

The understanding of on-site source 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 pathway and receptor wells also suggest 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.

Further monitoring through implementation of the OMP will provide a more comprehensive dataset and confirm the trend interpretation and the current understanding of the risk.

The data presented in this report does not significantly change the understanding of the conceptual site model (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) undertaken by GHD (GHD, 2019) determined that:

- PFAS poses a low risk to lower trophic level terrestrial and marine aquatic organisms across the Management Area;
- PFAS poses a low risk with respect to the potential for bioaccumulation in avian food chains across the Management Area, including the terrestrial environments of the base and Exmouth Gulf;
- PFAS poses a low risk with respect to the potential for bioaccumulation and biomagnification in marine mammals. While the PFAS concentrations estimated for fish in the nearshore environment of Exmouth Gulf (using beach seepage water PFAS concentrations) marginally exceeded the NEMP mammalian wildlife dietary guideline, 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 less than estimated and that PFAS poses a low risk with respect to bioaccumulation and biomagnification; and
- PFAS poses a low risk to marine turtles that could potentially nest along the beaches of the Management Area.

It was concluded that the information gathered during the ERA supported the conclusion made in the DSI, 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 (EGMPF).

Based on the current available data, including these collected as part of the 3-year implementation of the OMP, there is no significant change to this risk profile and any potential future 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 alter 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 reason including (but not limited to:

- Policy changes, regulatory requirements or regulator advices;
- Feedback and information received as part of stakeholder engagement activities;
- A change in the understanding of the risk for the site;
- Changes or refinements to the monitoring network, frequency and parameters;
- 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. In addition, the initial 3-year OMP implementation period has been reached which triggers an OMP review. Suitability of the monitoring network and frequency will be assessed as part of this review.

11 Conclusions

Groundwater, surface water, seepage water and sediment sampling were completed between November 2020 and October 2021 in accordance with the SAQP (Cardno, 2021a). Data from the DSI (GHD, 2018) is included and considered in this report to inform trends in PFAS concentrations over time.

Overall, the concentrations of PFAS across the media and locations sampled are consistent with historical data. Mann Kendall analysis on groundwater and surface water results predominantly indicated that there were no statistically significant trends. Some exceptions were noted including:

- Potential increasing trend of Sum of PFOS and PFHxS in groundwater at source area wells MW326, MW115, and of PFOA at MW126 and MW115.
- Potential decreasing trend of PFOA in groundwater at source area wells MW103D and MW143, and of Sum of PFOS and PFHxS at MW103D.
- Potential decreasing trend of PFOA in groundwater at off-site wells MW118D, MW133 and MW132.
- Potential increasing trend of Sum of PFOS and PFHxS at of-site groundwater monitoring well MW154S situated down-gradient of the source areas.

The nature and extent of PFAS across all media has not changed from the understanding presented in the investigation phases and the PMAP even though possible trends in groundwater (both decreasing and increasing depending on the location and analyte under review) are noted. It is possible that the plume could be migrating with groundwater towards the east as an increasing trend was noted at MW154S. However, it is either not reaching the coastline or dilution is occurring prior as the receptor wells and seepage water monitoring locations aren't detecting any PFAS concentration.

Based on the current available data there is no significant change to the risk profile of the Management Area or the CSM understanding.

The November 2020 - October 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. However, the OMP will be revised as the initial 3-year OMP implementation period has been reached.

Ongoing monitoring will be continued to obtain additional temporal data and further assess potential trends and changes in the plume extent and associated risk.

12 References

General References

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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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13. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
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21. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Ongoing Monitoring Plan'.
22. GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area B PFAS Investigations Detailed Site Investigation Report'.
23. GHD Pty Ltd, May 2019, reference: 3135526, 'Harold E Holt B Ecological Risk Assessment'.
24. Cardno, June 2021, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt B'*. (Cardno, 2021a)

25. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-Winter. (Cardno, 2021b)

26. Cardno, May 2021, PFAS OMP First Flush Sampling Event Factual Report. (Cardno, 2021c)

27. Cardno, August 2021, PFAS OMP Biannual Monitoring Factual Report, 2021 Post-Summer. (Cardno, 2021d)

28. Cardno, June 2021, 2020 Annual Interpretive Report, HEH-B – PFAS OMP. (Cardno, 2021e)

APPENDIX

A

FIGURES

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FIGURE 1

1:100,000Scale at A3

Meters

0 1,500 3,000

Site Location

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-11-11 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth

FIGURE 2

1:11,500Scale at A3

Meters

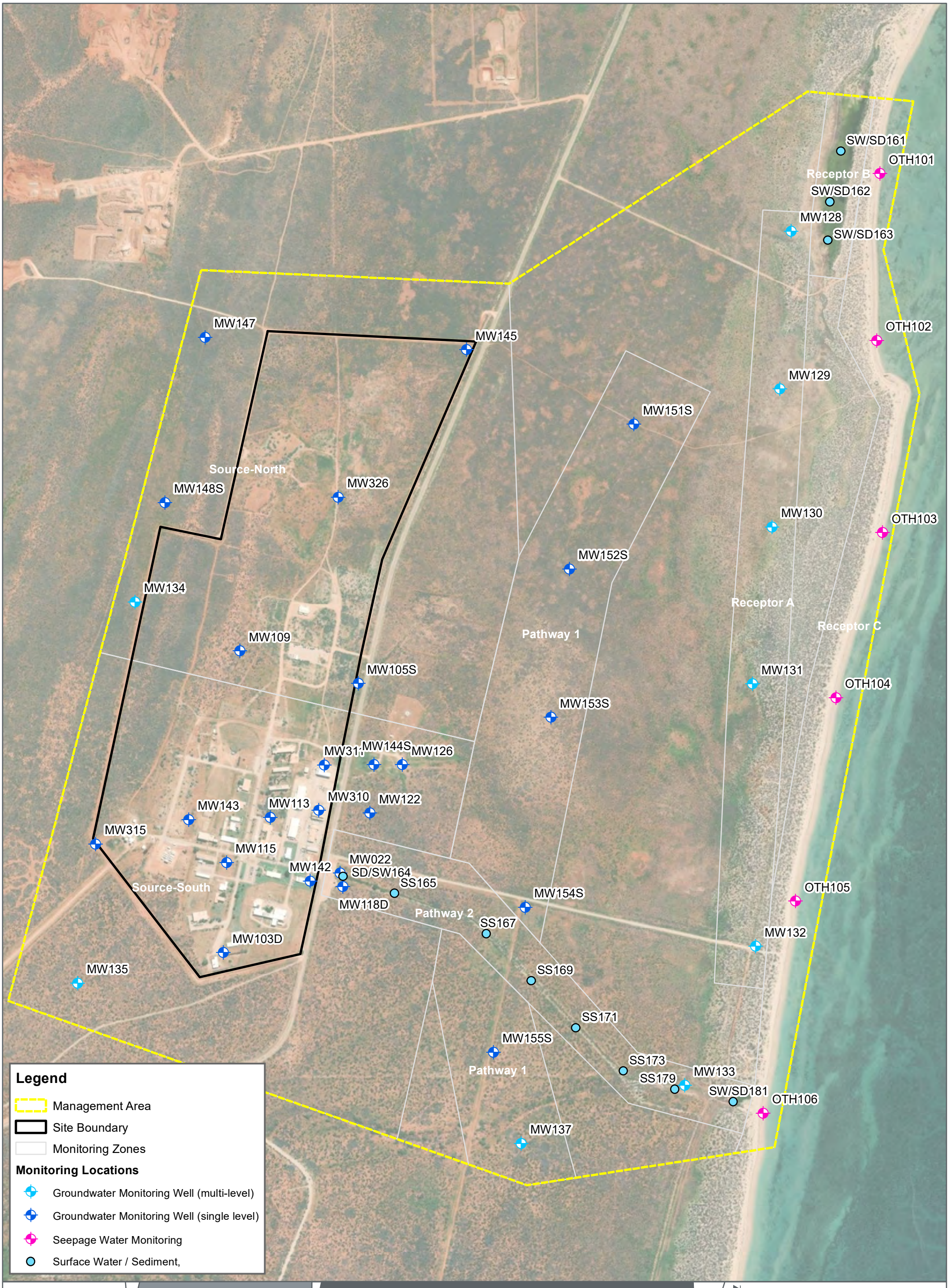
0 250 500

Management Area

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-11-11 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-002_ManagementAreas 02.mxd
Aerial Imagery Supplied by Google Earth


SW/SD161
OTH101
Receptor B
SW/SD162
MW128
SW/SD163
MW147
MW145
OTH102
MW129
MW151S
Source-North
MW148S
MW326
MW130
OTH103
MW152S
MW134
Receptor A
Receptor C
Pathway 1
MW109
MW105S
MW131
OTH104
MW153S
MW144S
MW31
MW126
MW310
MW122
MW143
MW113
MW315
MW115
MW022
SD/SW164
MW142
SS165
Source-South
MW154S
OTH105
MW118D
Pathway 2
SS167
MW103D
MW132
MW135
SS169
SS171
MW155S
SS173
MW133
SS179
SW/SD181
OTH106
Pathway 1
MW137
Legend
Management Area
Site Boundary
Monitoring Zones
Monitoring Locations
Groundwater Monitoring Well (multi-level)
Groundwater Monitoring Well (single level)
Seepage Water Monitoring
Surface Water / Sediment,
FIGURE 3
1:11,500Scale at A3
Meters
0
250
500
Monitoring Locations
ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE
N
Cardno
Map Produced by Cardno WA
Date: 2021-11-11 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-003_MonitoringLocations 03.mxd
Aerial Imagery Supplied by Google Earth

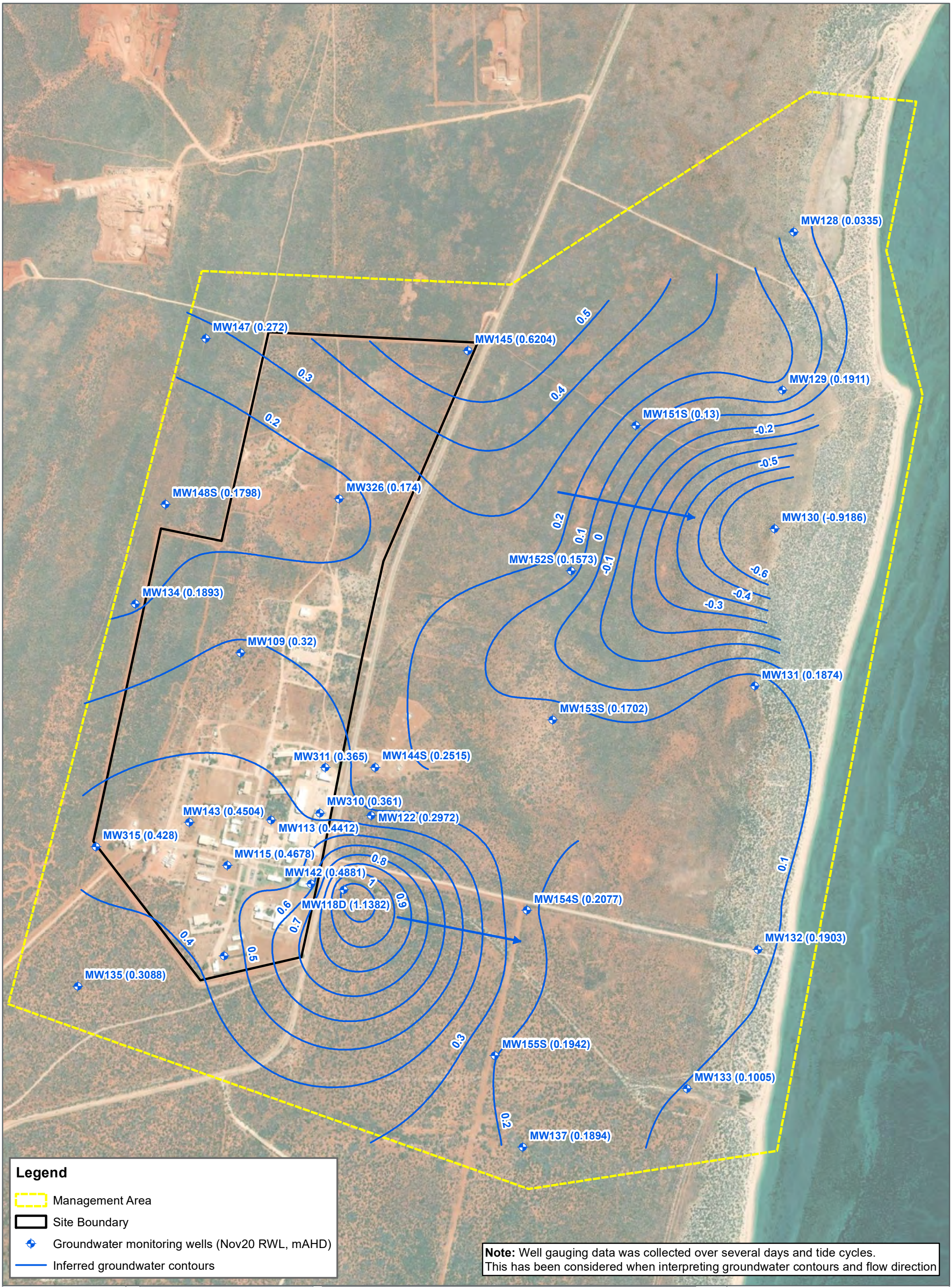


FIGURE 4A

1:11,500 Scale at A3

Meters

0 250 500

Inferred Groundwater Contours

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
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_0082-GS-003_GroundwaterContoursNov-20 01.mxd
Aerial Imagery Supplied by Google Earth

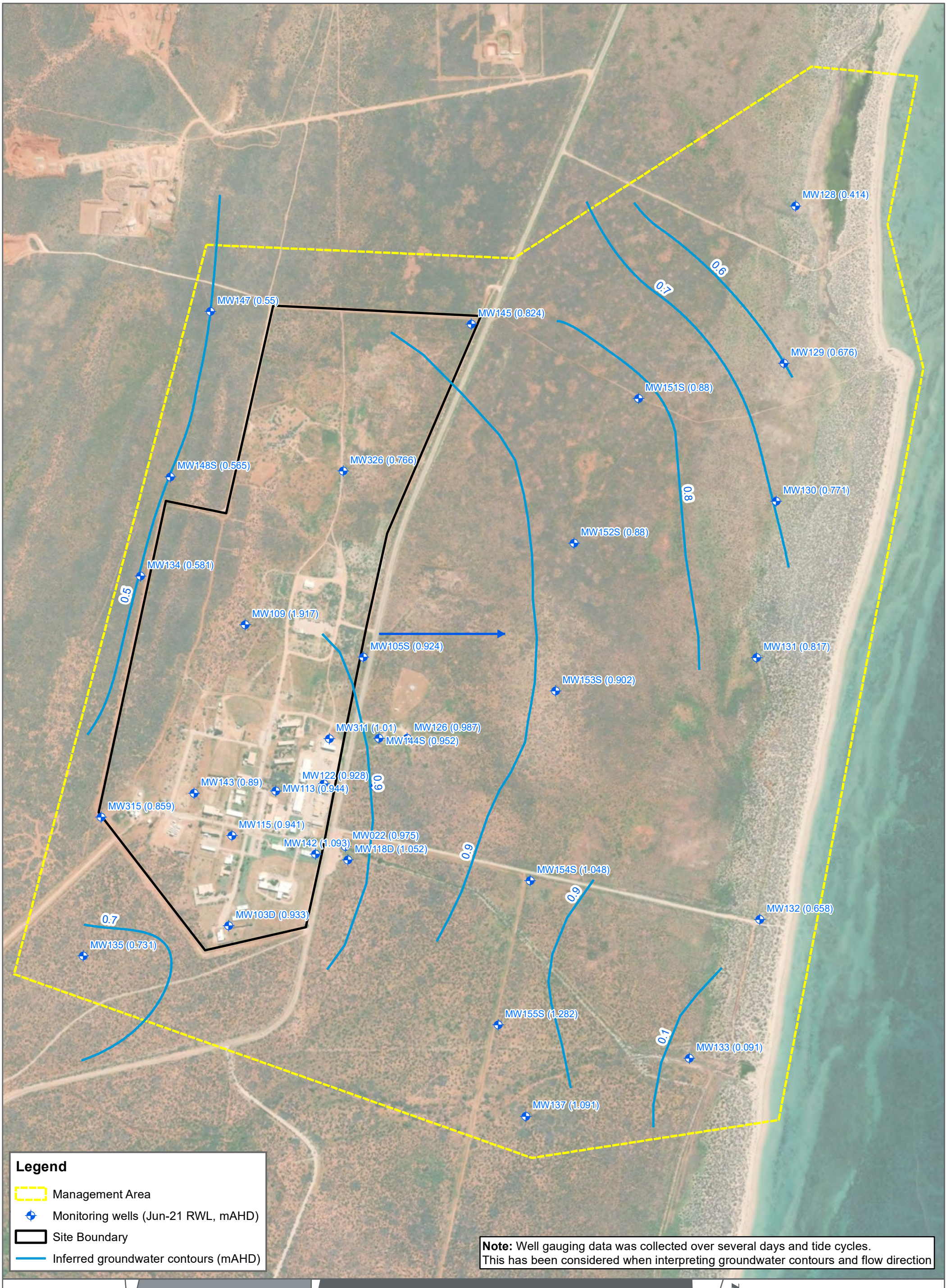


FIGURE 4B

1:11,500 Scale at A3

Meters

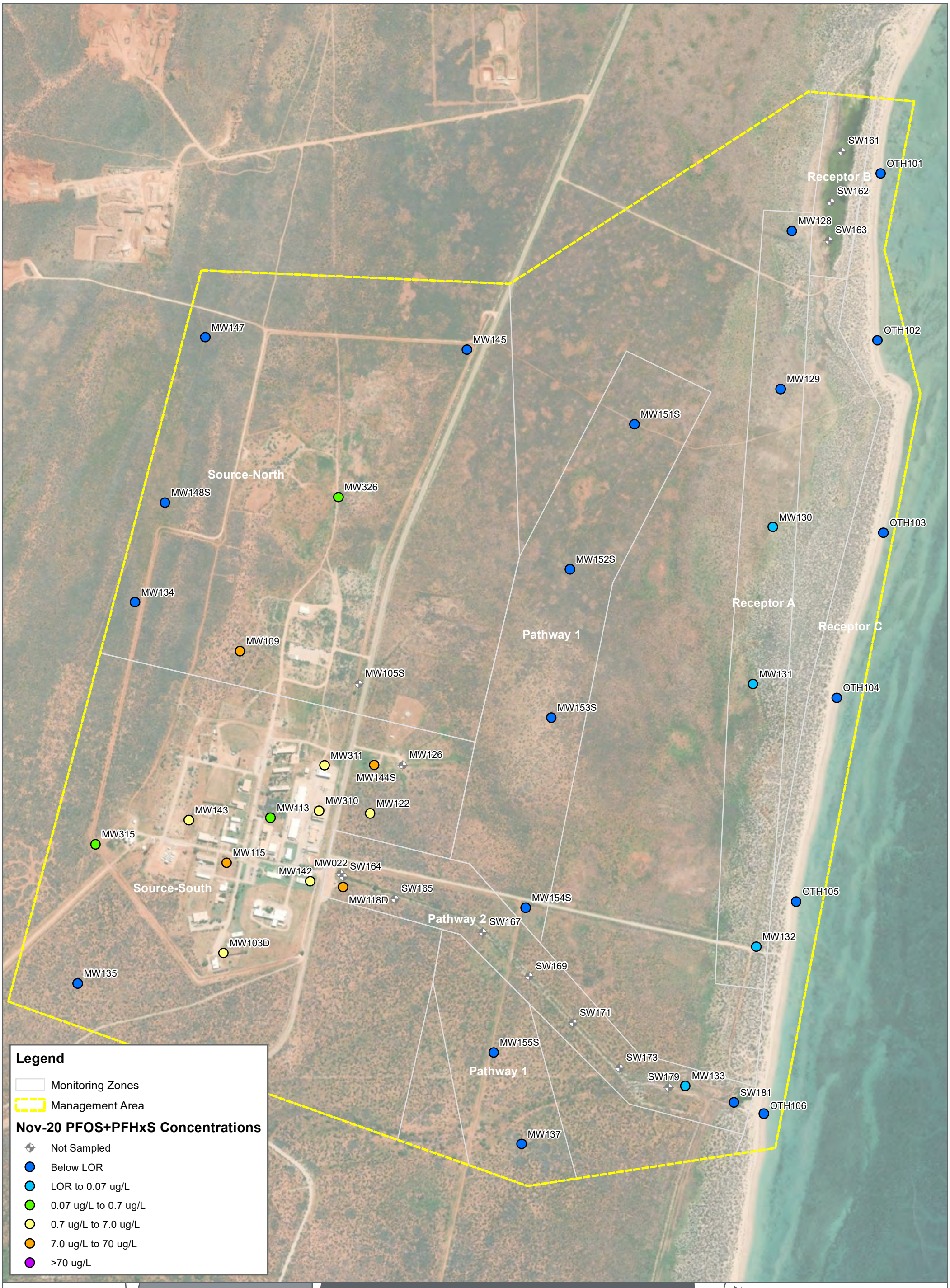
0 250 500

Inferred Groundwater Contours

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-11-12 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-004_GroundwaterContoursJun-21 01.mxd
Aerial Imagery Supplied by Google Earth


SW161
OTH101
Receptor B
SW162
MW128
SW163
MW147
MW145
OTH102
MW129
MW151S
Source-North
MW148S
MW326
MW130
OTH103
MW152S
MW134
Receptor A
Receptor C
Pathway 1
MW109
MW105S
MW131
OTH104
MW153S
MW311
MW126
MW144S
MW143
MW113
MW310
MW122
MW315
MW115
MW022
SW164
MW142
SW165
Source-South
MW118D
MW154S
Pathway 2
SW167
MW103D
MW132
MW135
SW169
SW171
MW155S
SW173
Pathway 1
SW179
MW133
SW181
OTH106
MW137
Legend
Monitoring Zones
Management Area
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 5
1:11,500 Scale at A3
Meters
0
250
500
PFOS+PFHxS concentrations - Nov20
ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE
Cardno
Map Produced by Cardno WA
Date: 2021-11-11 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-005_PFOS+PFHxS_Nov20 01.mxd
Aerial Imagery Supplied by Google Earth

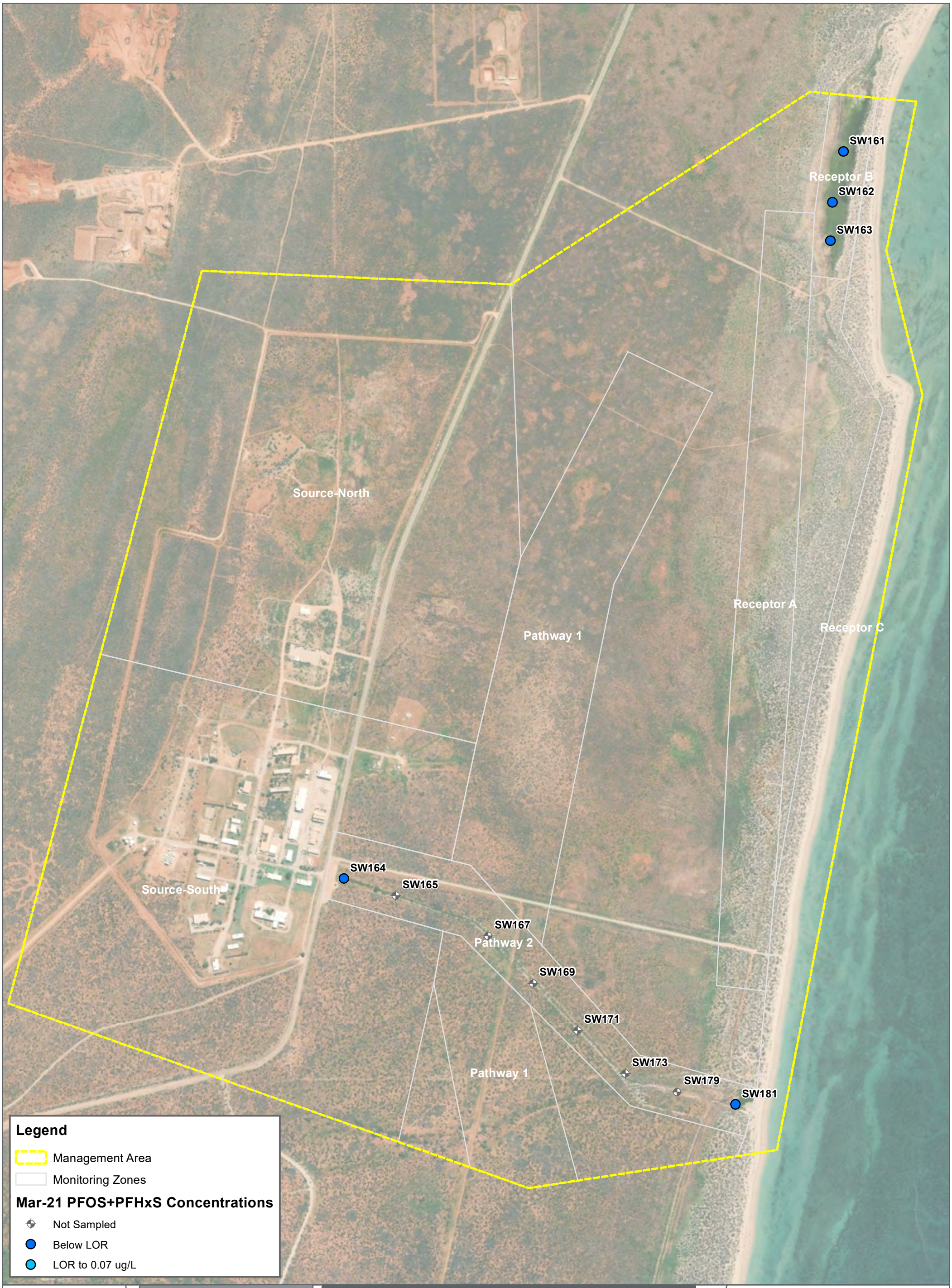


FIGURE 6

1:11,500 Scale at A3

Meters

0 250 500

PFOS+PFHxS concentrations - Mar 21

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-11-11 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-006_PFOS+PFHxS_March 21 01.mxd
Aerial Imagery Supplied by Google Earth

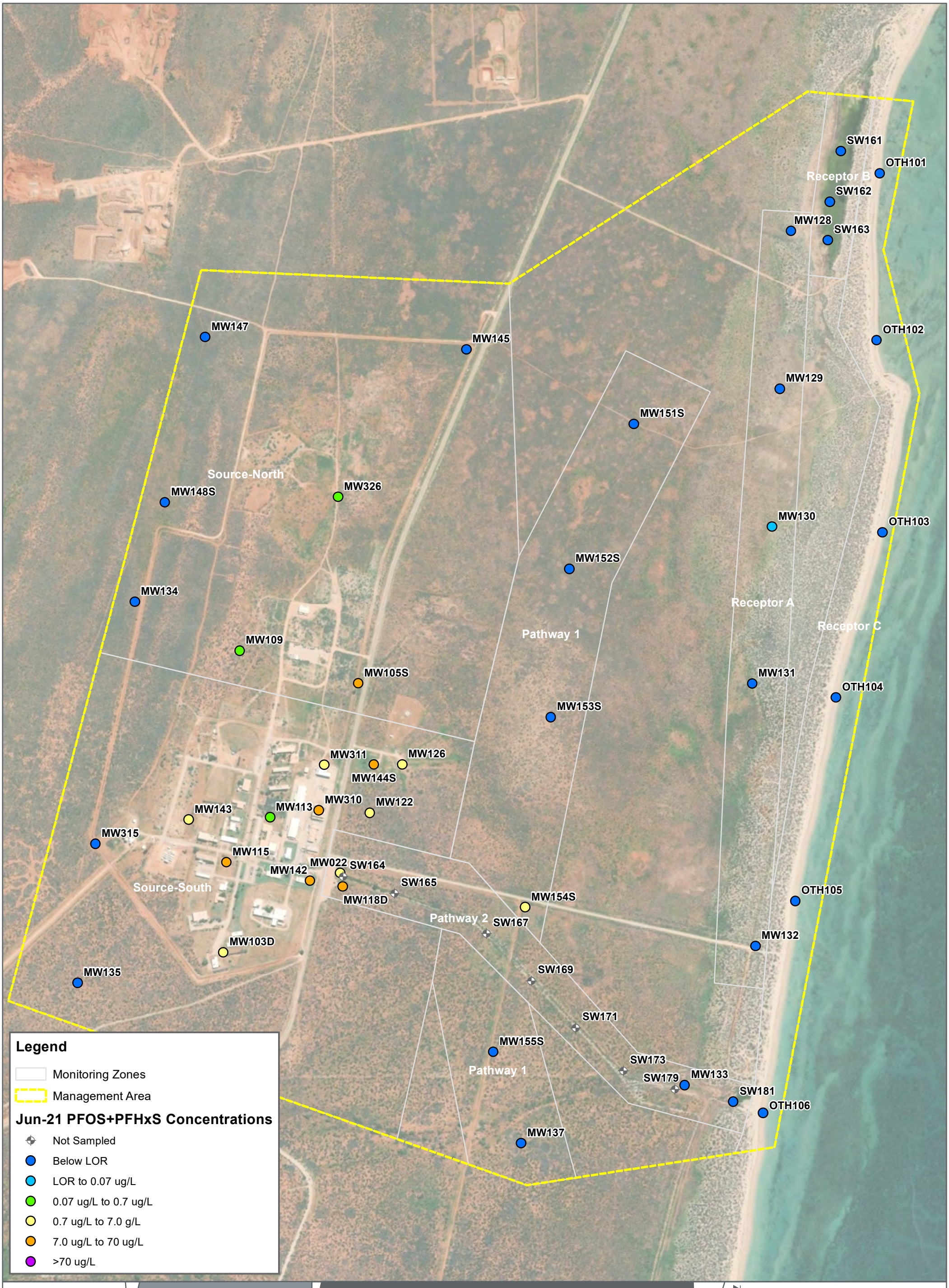


FIGURE 7

1:11,500 Scale at A3

Meters

0 250 500

PFOS+PFHxS concentrations - Jun-21

ANNUAL INTERPRETIVE REPORT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE

Cardno

Map Produced by Cardno WA
Date: 2021-11-11 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-007_PFOS+PFHxS_Jun21 01.mxd
Aerial Imagery Supplied by Google Earth

APPENDIX

B

SAQP

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

Naval Communication Station Harold Holt B

Prepared for

Department of Defence

14 June 2021

Cardno®

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Date	14 June 2021
Version Number	Rev 5

Maelle Bourdais
Environmental Engineer

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Principal/Regional WA Project Manager

Table of Contents

Tables

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 B (HEH-B), Exmouth, Western Australia (Figure 1, Appendix A).

The OMP SAQP applies to not only HEH-B, 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 B (Figure 1, Appendix A).
- "the Management Area" was defined as comprising the Site, plus the land extending to Exmouth Gulf (to the east and north-east) (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 HEHB PFAS Investigation have been used as a basis to develop this SAQP:

- Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'Management Area Plan'.
- Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Ongoing Monitoring Plan'
- GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area B PFAS Investigations Detailed Site Investigation Report'.
- GHD Pty Ltd, May 2019, reference: 3135526, 'Harold E Holt B Ecological Risk Assessment'.
- Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter, HEH-B.
- Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report HEH-B.
- Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-summer, HEH-B.
- Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-winter, HEH-B

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

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

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
HEHB – 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-B 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 interpretative 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 (NHMR), August 2019, *Guidance on Per and Polyfluoroalkly 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-B is located approximately 1,250 km north of Perth, two kilometres north of Exmouth and covers an area of 2,020 hectares (ha). HEHB was established in 1967 and is host to a High Frequency (HF) transmitter and associated administration facilities.

The Site is situated at the end of the North West Cape of WA, at the northern edge of Exmouth. The majority of the buildings and associated infrastructure and support services are located in the northern portion of the Site and include:

- HF transmitter.
- Base administration facilities.
- Service facilities including vehicle maintenance workshop.
- Former recreational and living quarters.
- Waste water treatment plant (WWTP)
- Water treatment plant (WTP).
- Firefighting services and training area (current and former).
- Landfill areas including Class IV landfill and asbestos landfill.
- Lease areas for non-military use including Sea Breeze Resort (no longer in active use).
- Other activities include former fuel storage and distribution, in above and below ground tanks and chemical storage (including paints and solvents).

[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.

2.1 Site Definition and Planning

For the purposes of this SAQP report, "the Site" is defined as comprising HEH-B. 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 B
Owner	Commonwealth of Australia
Title Details	Lot 43 on Plan P209471 and Lot 78 on Plan P211955
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-west corner: 199,167 mE, 7,576,901 mN ▪ North-east corner: 205,188 mE, 7,577,210 mN ▪ South-west corner: 204,428 mE, 7,572,508 mN ▪ South-east corner: 199,212 mE, 7,574,561 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	Vacant crown land (open space)
West	Vacant crown land (open space); Ningaloo Marine Park further to the west
East	Exmouth Gulf; commercial prawn fishing
South	Exmouth township

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-B typically range between 1 and 20 meters relative to the Australian Height Datum (m AHD). A natural ridge line runs north/south along the western boundary of the site, with the south-west portion of the site (specifically the water tower) being higher than the surrounding area.
Geology	**Regional Geology**

Setting	Description
	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. ▪ 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 superficial colluvium, comprising poorly sorted clay, silt, sand and gravel. Logs indicated between one and six meters of red silty sand at the surface, below which the sand becomes more dense and weakly cemented in places with coral limestone or shell fragments.
Acid Sulfate Soil	A review of the Acid Sulfate Soils (ASS) risk mapping, available on the WA Atlas online database indicates that the area encompassing the site is classified as having no known ASS disturbance risk. The coastline to the east of the Base is mapped as having a high to moderate risk of ASS occurring.
Hydrology	HEH-B has a local ridge line along the western boundary of the Base. A network of man-made, concrete lined drainage channels traverses the site, generally following the natural topography and exiting the base to the east beyond Murat Road. The majority of surface water run-off from the site therefore ultimately discharges to the coastline. However, a portion goes to the WWTP located on the Base. The area to the east of the Base, inland from the coastline, was observed to drain slowly after heavy rainfall. Areas of standing water were observed in low lying areas. Local surface water flow (including rainfall runoff) is expected to follow the local topography until it is either intersected by stormwater drainage systems on site, infiltrates the sub-surface, or collects at the backwater lagoon east of the Base.
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 in the Quaternary units is considered to be perched and discontinuous. The coastal dunes may also contain relatively fresh groundwater but of limited extent (lenses). ▪ **Groundwater Occurrence/Quality** – The Site consists of the following multi-layered aquifer system comprising of the following: – Exmouth North – Carnarvon Cape Range Limestone (unconfined) – Exmouth North Saline Resource – Birdrong Recharge of the aquifers occurs through direct recharge from rainfall infiltration, and indirect recharge along drainage lines from occasional sea water flooding and stormwater runoff. Hydraulic conductivities in the aquifer are likely to be highly heterogeneous and depend on the permeability of the overlying colluvium in the Quaternary sediments, and the degree of fracturing and connectivity of fractures in the deeper limestone. Groundwater salinity in the region is a result of the relationship between rainfall recharge, extraction, groundwater through flow and the intrusion of a salt water lens into the aquifer. The interface between the low and high salinity groundwater is considered to be diffuse and approximately 1 to 20 meters in thickness. Anecdotal advice suggests the presence of a fresh water body overlying the saline wedge.

Setting	Description
	▪ **Depth to Groundwater** – Groundwater has previously been recorded beneath the site at levels of between 0.59 and 1.02 m AHD (GHD, 2018) ▪ **Groundwater Flow Direction** – Groundwater on the Cape Range is likely to flow in a radial pattern from the range heights towards both east and west coasts. Groundwater flow in the Exmouth area is generally reported to the east towards the coast with some localised variability reported in some areas, including the former fire training ground where groundwater flow was reported by EarthTach (2016) to be to the north-west. ▪ **Groundwater Use** –A number of unregistered extraction bores are understood to be present at residential properties within the township of Exmouth, located approximately 4 km south of the Site. – DWER groundwater database indicates two extraction licences (with one bore each) allocated to two properties approximately 480 m northwest of the northern HEHB boundary. Seven registered groundwater bores were shown to be present approximately 7.2 km northwest of the northern Site boundary. – A borefield, comprising 16 potable water supply bores, is located approximately two to three kilometres south west of HEHB. Groundwater is extracted from the Cape Range aquifer and pumped via underground pipelines to a water treatment plant. ▪ **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 870 m southwest of the Site at its closest point. Priority 1 areas are usually undeveloped and under state management. ▪ **Receiving Surface Water Body** – Beneath the majority of the Site, groundwater is generally moving in an easterly direction towards the Exmouth Gulf. Groundwater is known to be influenced by tidal variations and inferred a north to north-easterly groundwater flow direction in the fire training area. Previous investigations reported a 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 7 km to the southwest of the Site at its closest point. ▪ The Bundegi Conservation Reserve is adjacent to the northeast of the Site. ▪ The Ningaloo Coast, a World Heritage listed site is located within 10km of HEHB. 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.
- Golders 2016, PFAS Environmental Management Program category 2 Property Data Gap Assessment - Harold E Holt 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 B PFAS Investigations Detailed Site Investigation Report').
- An Ecological Risk Assessment (GHD 2019).

4.1 Source Areas

There are 11 Source Areas where PFAS was detected in soil or groundwater. These are considered to be the most impacted areas and include (refer to Figure 2, Appendix A):

- Area 01 – Former Fire Training Area
- Area 02 – KC Hardstand – Fire Extinguisher Training Area
- Area 03 – Former Fire Training Area (pre-1992, WA0028)
- Area 04 – Former Fire Extinguisher Training Area
- Area 05 – Building 380 (Warehouse)
- Area 06 – Operational Fire Station
- Area 07 – Former Landfills
- Area 08 – Possible former fire training and AFFF Storage Area (Pre-1992)
- Area 09 – Former Fire Fighting Facility / Water Treatment Plant
- Area 10 – Waste Water Treatment Plant (WWTP)
- Area 11 – Class IV Landfill (WA0029)

PFAS concentrations in surface soils were highest in the source areas. The concentrations of PFAS did not exceed the screening criteria for protection of human health but exceeded the ecological screening criteria in a number of investigation areas (GHD, 2018).

It is likely that the concrete/asphalt of the KC hard stand (Area 02) and the fire station driveway (Area 06) are acting as ongoing sources of PFAS to sub surface soils and groundwater via leachate.

Estimates indicated that the greatest mass of PFAS remains in the soil and groundwater in the former fire training areas (Areas 08 and 05, and Area 01).

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 B 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 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. 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 **Groundwater and seepage water** At least one groundwater sample from each of the 11 areas investigated during the DSI (GHD, 2018) reported PFOS plus PFHxS exceedances both the human health guidelines (drinking water and recreational use), with the exception of Area 02 and Area 04 which exceeded only the drinking water guideline. PFOS was detected in the majority of groundwater samples both on and east of the Base with some localised elevated PFAS concentrations in groundwater. As the regional groundwater flow is generally toward the east, it is likely that there will be some discharge of groundwater as seepage water to the Exmouth Gulf, especially after periods of rainfall. **Surface Water** PFAS was detected in surface water east (down gradient) of the Base in the backwater lagoon area at concentrations exceeding the ecological screening criterion. Surface water at HEHB is predominantly ephemeral and the significance of PFAS exceedances of the relevant assessment criterion can be expected to be more related to its discharge to receiving surface water and impact on the aquatic ecosystems in these waters. **Sediment** The PFAS concentration in sediment samples did not exceed the assessment criteria relevant to ecological or human health risks. 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

Data Quality Step	Description
	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).
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 sixth months, with one monitoring event post-summer (June) and one post-winter (November). 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 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 0) 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 OMP, ERA or implemented management measures is warranted. Where exceedances of adopted assessment criteria levels (presented in Section 0) 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

Data Quality Step	Description
	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. The Annual Interpretative Report will review the results obtained against these triggers/decisions and the management response triggers and contingencies listed in the OMP (Section 4.3).
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. The Annual Interpretative Report will review the results obtained against these triggers/decisions.
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 (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

<table>
<tr><th>Data Quality Indicator</th><th>Detail</th></tr>
<tr><td>QA Documentation</td><td>Provision of appropriate work plans, DQI and DQO defined for the site and all QA/QC aspects documented.</td></tr>
<tr><td>Bias</td><td>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).</td></tr>
<tr><td>Representativeness</td><td>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.</td></tr>
<tr><td>Precision:</td><td>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:
<table>
<tr><th>Magnitude of result</th><th>Acceptable RPD range</th></tr>
<tr><td><10 x limited of reporting (LOR)</td><td>No limits</td></tr>
<tr><td>10 – 20 x LOR</td><td>0% - 50%</td></tr>
<tr><td>>20 x LOR</td><td>0% - 20%</td></tr>
</table>
▪ 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).
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).</td></tr>
<tr><td>Accuracy</td><td>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).</td></tr>
<tr><td>Comparability</td><td>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.</td></tr>
<tr><td>Completeness</td><td>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.</td></tr>
</table>

[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 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	22/11/2019	all	Minor edits	Defence comments
Rev 3	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 4	17/05/2021	6.3	Table 'Wells construction details' added.	Defence review
		6	Methodology tables updates	
Rev 5	14/06/2021	-	Correct typos and minor updates throughout	Defence Review

6.2 Management 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 "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 to the east and north-east of the Base (down-gradient) to the coastline and including the backwater lagoon area.

> The drainage channel south-east of the Base.

The Management Area excludes the Base supply borefield located to the south-west of the Site (up-gradient) as previous investigation did not report PFAS detect from any of the samples collected from potable supply bores and post treatment samples (GHD 2018 & 2019).

6.3 Groundwater Monitoring

6.3.1 Groundwater Monitoring Network

The groundwater monitoring network, sampled as part of the DSI (GHD 2018), includes 94 single level monitoring wells and 10 multilevel wells. The network of on- and off-Site groundwater monitoring locations are summarised in Table 6-2 and Table 6-3.

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

Area	Average screen interval (mBGL)	Monitoring Well / Bore ID
Source South	2.5 – 12.5	MW315, MW316, MW317, MW318, MW302, MW303, MW304, MW305, MW306, MW307, MW308, MW309, MW310, MW311, MW313, MW314, MW101, MW102, MW103D, MW103S, MW112, MW113, MW114_D, MW114S, MW115, MW116, MW117, MW119, MW120D, MW120S, MW122, MW123, MW124, MW125D, MW125S, MW126, MW127, MW138, MW139, MW141, MW142, MW143, MW144D, MW144S, MW150
Source North	3.0 – 10.0	MW319, MW328, MW330, MW321, MW322, MW327, MW325, MW323, MW320, MW326, MW331, MW332, MW333, MW334, MW335, MW336, MW104, MW105D, MW105S, MW106D,

Area	Average screen interval (mBGL)	Monitoring Well / Bore ID
		MW106_S, MW107, MW108, MW109, MW110, MW111 MW140, MW145, MW146, MW147, MW148S
Pathway 1	1.0 14.5	MW151D, MW151S, MW152D, MW152S, MW153D, MW153S, MW154D, MW154S, MW155D, MW155S, MW156D, MW156S
Pathway 2	3.5 – 11.5	MW118D, MW118S, MW121,

Table 6-3 HEHB Groundwater Monitoring Network (multi-level)

Well ID	Screen interval (mBGL)	Time Sampled	DSI (2018) Concentration Range		
			Sum of PFHxS + PFOS (µg/L)	PFOS (µg/L)	PFOA (µg/L)
MW128	1.7 – 2.2	0	-	-	-
	3.7 – 4.2	2	ND	<0.0002 – **0.001**	ND
	5.7 – 6.2	2	ND – 0.002	<0.0002 – **0.002**	ND
	7.7 – 8.2	2	ND	<0.0002	0.001
MW129	1.5 – 2.0	0	-	-	-
	3.5 – 4.0	2	ND	<0.0002	ND
	5.5 – 6.0	2	ND	<0.0002	ND
	7.5 – 8.0	2	ND	<0.0002	ND
MW130	2.9 – 3.4	2	0.005 – 0.013	**0.004** – **0.011**	ND
	4.9 – 5.4	2	0.052 – 0.232	**0.048** – **0.16**	ND – 0.002
	6.9 – 7.4	2	0.005 – 0.007	**0.003** – **0.004**	ND
MW131	2.0 – 2.5	2	ND – 0.004	<0.0002 – **0.004**	ND
	4.0 – 4.5	2	ND	<0.0002	ND
	6.0 – 6.5	2	0.001 – 0.002	**0.001** – **0.002**	ND
	8.0 – 8.5	2	ND	<0.0002	ND
MW132	4.4 – 4.9	0	-	-	-
	6.4 – 6.9	2	0.015 – 0.034	<0.0002 – **0.002**	0.008 – 0.025
	8.5 – 9.0	2	ND - 0.004	<0.0002 – **0.004**	0.002 – 0.014
MW133	1.0 – 1.5	0	-	-	-
	3.0 – 3.5	2	0.03 – 0.038	**0.020** – **0.029**	0.002 – 0.004
	5.0 – 5.5	2	0.034 – 0.042	**0.020** – **0.030**	0.004
	7.0 – 7.5	2	0.022 – 0.031	**0.008** – **0.020**	ND – 0.001
MW134	4.6 – 5.1	0	-	-	-
	6.6 – 7.1	2	ND	<0.0002	ND
	8.6 – 9.1	2	0.002 – 0.003	**0.002** – **0.003**	ND – 0.001
MW135	8.3 – 8.8	2	ND – 0.008	<0.0002 – **0.007**	ND
	10.3 – 10.8	2	0.007 – 0.016	**0.005** – **0.012**	ND – 0.001

Well ID	Screen interval (mBGL)	Time Sampled	DSI (2018) Concentration Range		
			Sum of PFHxS + PFOS (µg/L)	PFOS (µg/L)	PFOA (µg/L)
MW136	4.5 – 5.0	0	-	-	-
	6.5 – 7.0	2	ND – 0.006	<0.0002 – **0.006**	ND
	8.5 – 9.0	2	0.008 – 0.01	**0.006** – **0.007**	ND – 0.001
	10.5 – 11.0	2	0.006 – 0.012	**0.004** – **0.009**	ND – 0.001
MW137	4.1 – 4.6	0	-	-	-
	6.1 – 6.6	2	ND - 0.001	<0.0002 – **0.001**	ND
	8.1 – 8.6	2	0.008 – 0.015	**0.007** – **0.015**	ND
	10.1 – 10.6	2	0.006 – 0.017	**0.005** – **0.013**	ND – 0.001

Notes:

1. ND = Non Detects(<LOR)
2. - = not samples
3. **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)
On-Site – Source South	0082_MW310, 0082_MW311, 0082_MW315, 0082_MW103D, 0082_MW113, 0082_MW115, 0082_MW142, 0082_MW143	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.
Off-Site – Source South	0082_MW135, 0082_MW122, 0082_MW126, 0082_MW144S	
On-Site – Source North	0082_MW326, 0082_MW105S, 0082_MW109, 0082_MW145	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.
Off-Site – Source North	0082_MW134, 0082_MW147, 0082_MW148S	
Off-Site - Pathway 1	0082_MW151S, 0082_MW152S, 0082_MW153S, 0082_MW154S, 0082_MW137, 0082_MW155S	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.
Off-Site - Pathway 2	0082_MW118D, 0082_MW133, 0082_MW022	
Off-Site - Receptor A	0082_MW128, 0082_MW129, 0082_MW130, 0082_MW131, 0082_MW132	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 aquatic receptors.
Off-Site - Receptor C	**Seepage water:** 0082_OTH101, 0082_OTH102, 0082_OTH103, 0082_OTH104, 0082_OTH105, 0082_OTH106	Assessment of changes in PFAS concentration and distribution in the main aquatic receptors.

Notes:

1. *Source: Defence, PFAS Investigation and Management Branch, May 2019, reference: Naval Communication Station Harold E Holt Area B 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)
MW022	2005	203690.76	7576790.86	6.675	7	4.0 – 7.0
MW103D	2018	203329.431	7576537.142	9.3778	15	11.0 – 15.0
MW105S	2018	203735.824	7577382.464	3.8438	4	2.0 – 4.0
MW109	2018	203363.095	7577476.969	5.627	10	4.0 – 10.0
MW113	2018	203468.605	7576960.375	6.6842	9.5	4.5 – 9.5
MW115	2018	203334.105	7576817.814	7.7258	10.3	5.3 – 10.3
MW118D	2018	203698.84	7576749.01	6.2622	11.5	7.5 – 11.5
MW122	2018	203779.883	7576980.204	5.0782	8.5	3.8 – 8.5
MW126	2018	203878.437	7577131.909	4.8325	8.5	4.5 – 8.5
MW128	2018	205064.572	7578814.858	2.5408	2.2	1.7 – 2.2
				2.5435	4.2	3.7 – 4.2
				2.5435	6.2	5.7 – 6.2
				2.5402	8.2	7.7 – 8.2
MW129	2018	205037.92	7578323.165	2.5409	2	1.5 – 2.0
				2.5311	4	3.5 – 4.0
				2.5360	6	5.5 – 6.0
				2.5329	8	7.5 – 8.0
MW130	2018	205021.909	7577893.294	2.3879	3.4	2.9 – 3.4
				2.4364	5.4	4.9 – 5.4
				2.4665	7.4	6.9 – 7.4
MW131	2018	204969.244	7577404.156	2.8798	2.5	2.0 – 2.5
				2.8774	4.5	4.0 – 4.5
				2.8901	6.5	6.0 – 6.5
				2.8750	8.5	8.0 – 8.5
MW132	2018	204993.966	7576588.225	5.4103	4.9	4.4 – 4.9
				5.4349	6.9	6.4 – 6.9
				5.4383	9.0	8.5 – 9.0
MW133	2018	204781.097	7576151.267	2.1554	1.5	1.0 – 1.5
				2.1505	3.5	3.0 – 3.5
				2.1642	5.5	5.0 – 5.5
				2.1639	7.5	7.0 – 7.5
MW134	2018	203032.294	7577623.013	6.5431	5.1	4.6 – 5.1
				6.5343	7.1	6.6 – 7.1
				6.5308	9.1	8.6 – 9.1
MW135	2018	202874.901	7576434.208	9.3010	10.8	10.3 – 10.8
				9.2988	8.8	8.3 – 8.8
MW137	2018	204272.302	7575960.642	5.3829	10.6	10.1 – 10.6

Well ID	Date drilled	Easting[1]	Northing[1]	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
				5.3964	4.6	4.1 – 4.6
				5.3984	6.6	6.1 – 6.6
				5.3907	8.6	8.1 – 8.6
MW142	2018	203597.027	7576765.258	7.5281	10.5	4.5 – 10.5
MW143	2018	203213.083	7576948.347	10.5204	13	7.0 – 13.0
MW144S	2018	203789.728	7577130.423	6.0715	8	2.0 – 8.0
MW145	2018	204055.272	7578427.366	3.8644	6.9	0.9 – 6.9
MW147	2018	203236.792	7578450.511	5.51	8.5	4.5 – 8.5
MW148S	2018	203120.357	7577933.916	5.7648	9	3.0 – 9.0
MW151S	2018	204583.686	7578205.221	3.4	5	1.0 – 5.0
MW152S*		204389.713	7577750.926	3.4103	6.5	2.5 – 6.5
MW153S	2018	204340.792	7577288.126	4.7872	6	2.0 – 6.0
MW154S	2018	204271.556	7576695.5	3.8177	6	2.0 – 6.0
MW155S	2018	204179.752	7576243.764	5.0072	8.5	2.5 – 8.5
MW310	2011	203619.44	7576985.36	5.401	6.5	3.5 – 6.5
MW311	2011	203631.98	7577127.96	4.205	5.5	2.5 – 5.5
MW315	1995	202923.01	7576867.54	8.018	9.5	6.5 – 9.5
MW326*		203662.07	7577961.15	2.611		

Note: * No bore log available

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 and Seepage 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. Wells along the coastline will be gauged during the same tidal period.
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.

Activity	Details
	▪ 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) well 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. SWL and field parameters will be monitored during purging and post sample collection to ensure limited drawdown effects. The groundwater will be sampled when the field parameters have stabilised.
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 (i.e. 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	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. ▪ 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 in 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 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 sediment locations were sampled as part of the DSI (GHD 2018) on and off-site including:

> The on-Site drainage channels (11).

> The off-Site drainage channel to the Exmouth Gulf (18).

> The Backwater Lagoon (3).

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)
Off-Site - Pathway 2	0082_SW164, 0082_SW181, 0082_SS165, 0082_SS167, 0082_SS169, 0082_SS171, 0082_SS173, 0082_SS179	0082_SD164, 0082_SD181, 0082_SS165, 0082_SS167, 0082_SS169, 0082_SS171, 0082_SS173, 0082_SS179	Confirmation of the presence of PFAS in the main drainage channel from the Base which discharges in to Exmouth Gulf. Monitoring of these locations will provide an indication of any change in the nature or magnitude of PFAS in surface waters and sediments, and will help in determining changes attributable to seasonal fluctuations. First flush monitoring to assess the potential increase in PFAS surface water and sediment concentrations following first flush rainfall and subsequent timeframe for attenuation to 'long-term average' concentrations
Off-Site - Receptor B	0082_SW161, 0082_SW162, 0082_SW163	0082_SD161, 0082_SD162, 0082_SD163	Confirmation of the presence of PFAS in the Backwater Lagoon.

Source: Defence, PFAS Investigation and Management Branch, May 2019, reference: Naval Communication Station Harold E Holt Area B 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.
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)].

Item	Details
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: ▪ 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. 1 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 response triggers and contingencies detailed 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 2.0 (NEMP), 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. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'Management Area Plan'.
17. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Ongoing Monitoring Plan'
18. GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area B PFAS Investigations Detailed Site Investigation Report'.
19. GHD Pty Ltd, May 2019, reference: 3135526, 'Harold E Holt B Ecological Risk Assessment'.
20. Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter, HEH-B.
21. Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report HEH-B.
22. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-summer, HEH-B.
23. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post-winter, HEH-B
24. Cardno, April 2021, PFAS OMP First Flush Sampling Event Factual Report HEH-B.
25. Cardno, April 2021, 2020 Annual Interpretive Report, HEH-B.

APPENDIX

A

Figures

FIGURE 1

1:100,000Scale at A3

Meters

0 1,500 3,000

Site Location

SAMPLING AND ANALYSIS QUALITY PLAN
HAROLD E HOLT AREA B
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_0082-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth

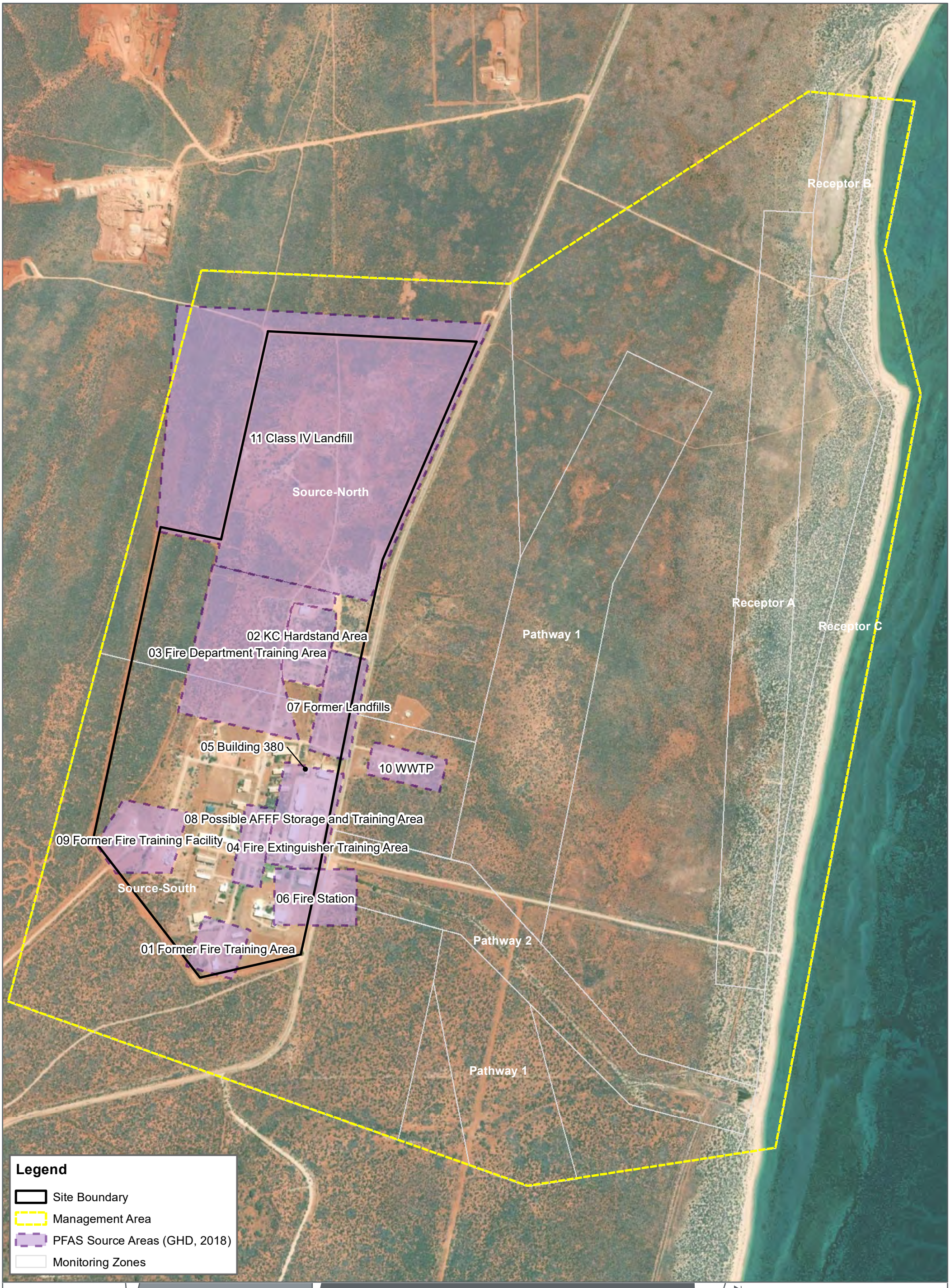

FIGURE 2

1:11,500 Scale at A3

Meters

0 250 500

Management Area

SAMPLING AND ANALYSIS QUALITY PLAN
HAROLD E HOLT AREA B
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_0082-GS-002_ManagementAreas 02.mxd
Aerial Imagery Supplied by Google Earth

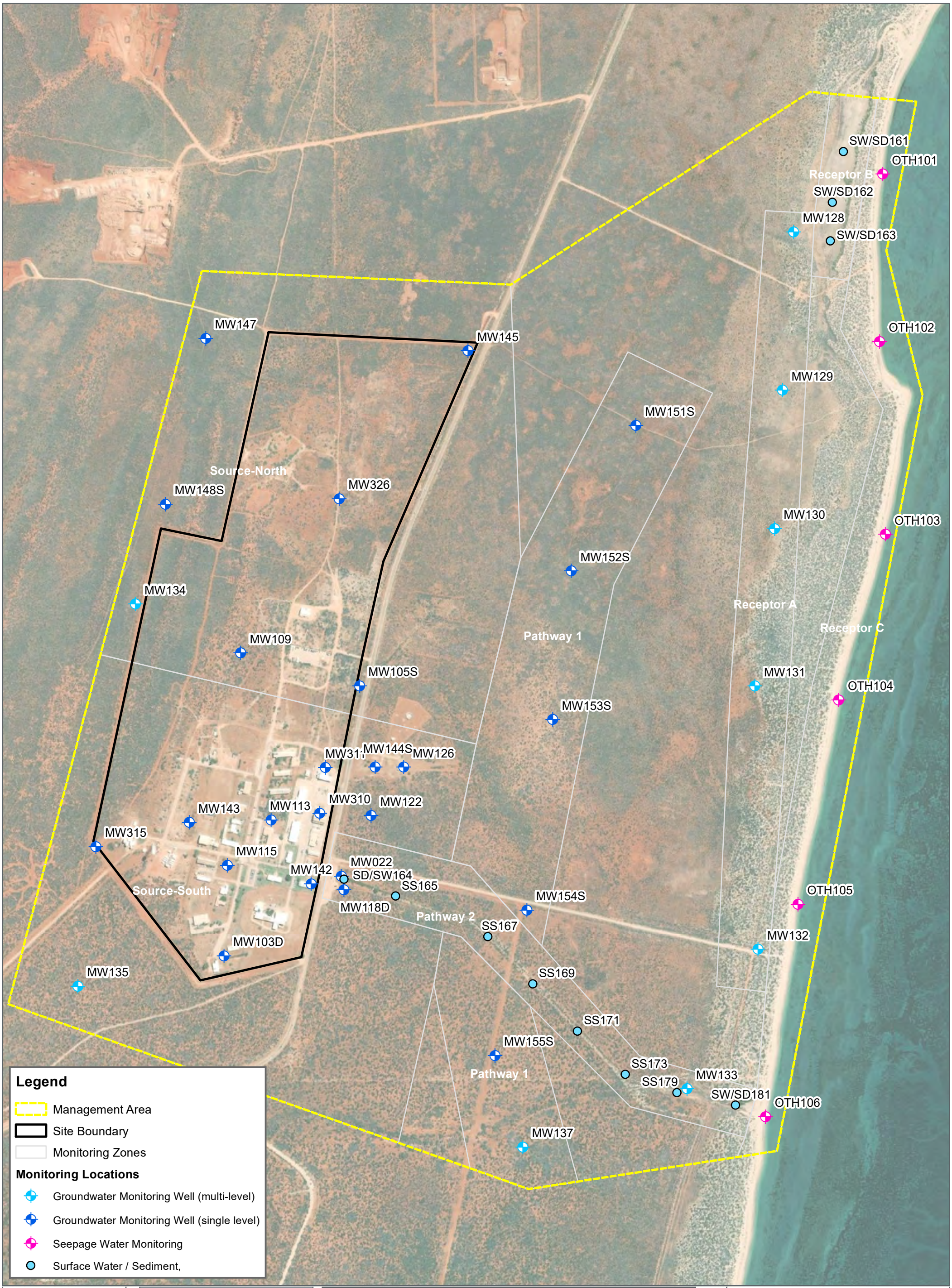

FIGURE 3

1:11,500 Scale at A3

Meters

0 250 500

Monitoring Locations

SAMPLING AND ANALYSIS QUALITY PLAN
HAROLD E HOLT AREA B
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_0082-GS-003_MonitoringLocations 03.mxd
Aerial Imagery Supplied by Google Earth

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 B

Prepared for

Department of Defence

22 February 2021

Cardno

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0.0	5/01/2021	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	22/02/2021	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)
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-B	Naval Communication Station Harold E Holt Area B
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 B ("HEH-B" 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, 15 June 2020, Reference: DEF19009, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt B*'.

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 B.

> "the Management Area" was defined as comprising the Site, plus the land extending to the Exmouth Gulf (to the east and north-east) (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 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
On-Site – Source South	0082_MW310, 0082_MW311, 0082_MW315, 0082_MW103_D, 0082_MW113, 0082_MW115, 0082_MW142, 0082_MW143
Off-Site – Source South	0082_MW135, 0082_MW122, 0082_MW126, 0082_MW144_S
On-Site – Source North	0082_MW326, 0082_MW105_S, 0082_MW109, 0082_MW145
Off-Site – Source North	0082_MW134, 0082_MW147, 0082_MW148_S
Off-Site - Pathway 1	0082_MW151_S, 0082_MW152_S, 0082_MW153_S, 0082_MW154_S, 0082_MW137, 0082_MW155_S
Off-Site - Pathway 2	0082_MW118_D, 0082_MW133, 0082_MW022
Off-Site - Receptor A	0082_MW128, 0082_MW129, 0082_MW130, 0082_MW131, 0082_MW132

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
Off-Site - Receptor C	0082_OTH101, 0082_OTH102, 0082_OTH103, 0082_OTH104, 0082_OTH105, 0082_OTH106

[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
Off-Site - Pathway 2	0082_SW164, 0082_SW181, 0082_SS165, 0082_SW167, 0082_SW169, 0082_SW171, 0082_SW173, 0082_SW179
Off-Site - Receptor B	0082_SW161, 0082_SW162, 0082_SW163

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
Off-Site - Pathway 2	0082_SD164, 0082_SD181, 0082_SS165, 0082_SS167, 0082_SS169, 0082_SS171, 0082_SS173, 0082_SS179
Off-Site - Receptor B	0082_SD161, 0082_SD162, 0082_SD163

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
MW105S	Not sampled	This groundwater monitoring bore was found dry.
MW022	Not sampled	Unable to sample due to bore locked with a padlock.
MW126	Not sampled	Access to the area was restricted for Asbestos removal works.
SW161, SW162, SW163, SW164, SW165, SW167, SW169, SW171, SW173, SW179	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:

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, 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.

Activity	Details
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). ▪ TOC, 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

Groundwater 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 in a generally easterly direction towards the Exmouth Gulf, 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. 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]	1.10 (MW118D)	30	0
PFOS	MW103D, MW109, MW113, MW115, MW118D, MW122, MW130, MW131, MW133, MW142, MW143, MW144S, MW154S, MW310, MW311, MW315, MW326.	0.01[3]	14.3 (MW118D)	30	17
Sum of PFHxS and PFOS	MW103D, MW109, MW115, MW118D, MW142, MW143, MW144S, MW310.	2[2]	20.5 (MW118D)	30	8

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:

- MW131 (off-Site, Receptor A – Exmouth Gulf) reported a first time detection of Sum of PFOS and PFHxS above LOR (0.02 µg/L) and a new exceedance of the HEPA (2020) ecological criteria for 99% species protection for PFOS (detected PFOS concentration of 0.02 µg/L).
- There was no first time detection of PFOA at the groundwater monitoring locations during the 2020 post-winter monitoring event.

4.3 Seepage Water

4.3.1 Summary of Field Observations

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.

4.3.2 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 4-2. 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.

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	6	0
PFOS	-	0.01[3]	<0.01	6	0
Sum of PFHxS and PFOS	-	2[2]	<0.01	6	0

Notes:

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results[1]	No. Results Above Criteria

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:

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

> 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.

> No new exceedance of a guideline value was reported for any of the seepage water monitoring locations during the 2020 post-winter monitoring event.

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 at the time of sampling.

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. A summary of results exceeding the adopted criteria is presented in Table 4-3. 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.

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]	<0.01	1	0
PFOS	-	0.01[3]	<0.01	1	0
Sum of PFHxS and PFOS	-	2[2]	<0.01	1	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:

> The surface water sample reported PFAS concentrations below the laboratory LOR.

> There was no first time detection of PFOA or Sum of PFOS and PFHxS or at the surface water monitoring location SW181 during the 2020 post-winter monitoring event.

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 4-4. Laboratory results have also been compared to available historical data. Figure 5 in Appendix A presents the sediment monitoring locations.

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]	0.0005 (SS165)	11	0
PFOS	SD164	0.01[3]	0.0345 (SD164)	11	1
Sum of PFHxS and PFOS	-	20[4]	0.0395 (SD164)	11	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:

- SD164 reported a new exceedance of the HEPA (2020) ecological criteria for indirect exposure for PFOS (0.0345 mg/kg detected)
- 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.

4.6 Changes to the Monitoring Network Condition

Groundwater monitoring well MW022 was found locked with a padlock.

No other changes to the monitoring network condition were noted during this sampling event.

5 Summary and Conclusions

Cardno undertook the 2020 post-winter groundwater, seepage water, surface water and sediment monitoring event at HEH-B as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 30 monitoring bores, one (1) surface water locations, six (6) seepage water sampling locations and 11 sediment monitoring locations. Three groundwater monitoring bores and ten surface water monitoring locations could not be sampled as these were found dry (11) or inaccessible for sampling (2).

Groundwater levels were gauged in all wells before sampling. Groundwater flow direction was interpreted to be easterly (i.e. groundwater flows towards the ocean), which is consistent with previous monitoring events.

The groundwater laboratory results reported the following:

> Of the 30 samples that were tested, PFOS (17 samples) and Sum of PFHxS and PFOS (8 samples) reported concentrations that exceeded adopted assessment criteria.

> MW131 reported a first time detection of Sum of PFOS and PFHxS and a new exceedance of the HEPA (2020) ecological criteria for PFOS.

PFAS analytical results for the 2020 post-winter monitoring event were generally of the same order of magnitude as previous results.

The seepage water laboratory results reported the following:

> All six samples that were tested reported PFAS concentrations below the laboratory LOR.

> No first-time detection of PFOA or Sum of PFOS and PFHxS, or new exceedance of guideline value were reported at any of the seepage water monitoring locations.

The surface water laboratory results reported the following:

> The sample tested (SW181) reported all PFAS concentrations below the laboratory LOR and therefore, no exceedance of the adopted assessment criteria.

> There was no first-time detection of PFOA or Sum of PFOS and PFHxS, or new exceedance of a guideline value at SW181.

The sediment laboratory results reported the following:

> Of the 11 samples tested, 5 samples were reported above the LOR for PFOS and sum of PFHxS and PFOS and 2 samples were above the LOR for PFOA.

> Of the 11 samples that were tested, one sample (SD164) exceeded the HEPA (2020) ecological indirect exposure criteria for PFOS for the first time.

> No first-time detection of PFOA or Sum of PFOS and PFHxS were reported at any of the sediment monitoring locations.

The next OMP sampling event for HEH-B 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. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Management Area Plan.
17. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Ongoing Monitoring Plan'
18. GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area B PFAS Investigations Detailed Site Investigation Report'.
19. GHD Pty Ltd, May 2019, reference: 3135526, 'Harold E Holt B Ecological Risk Assessment'.
20. Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter.
21. Cardno, June 2020, PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Rev 3.
22. Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report.

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 B
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_0082-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth

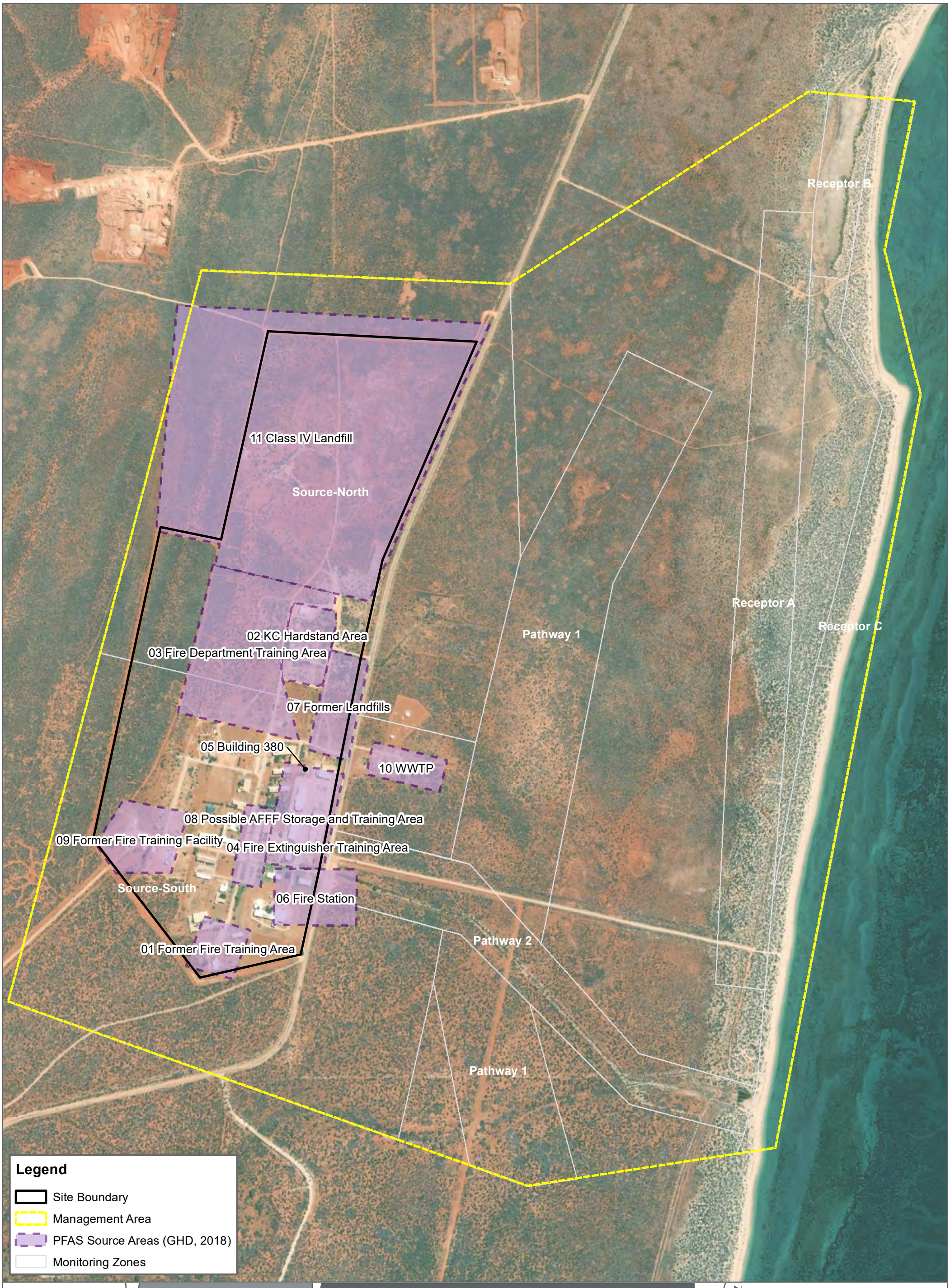

FIGURE 2

1:11,500 Scale at A3

Meters

0 250 500

Management Area

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-002_ManagementAreas 02.mxd
Aerial Imagery Supplied by Google Earth

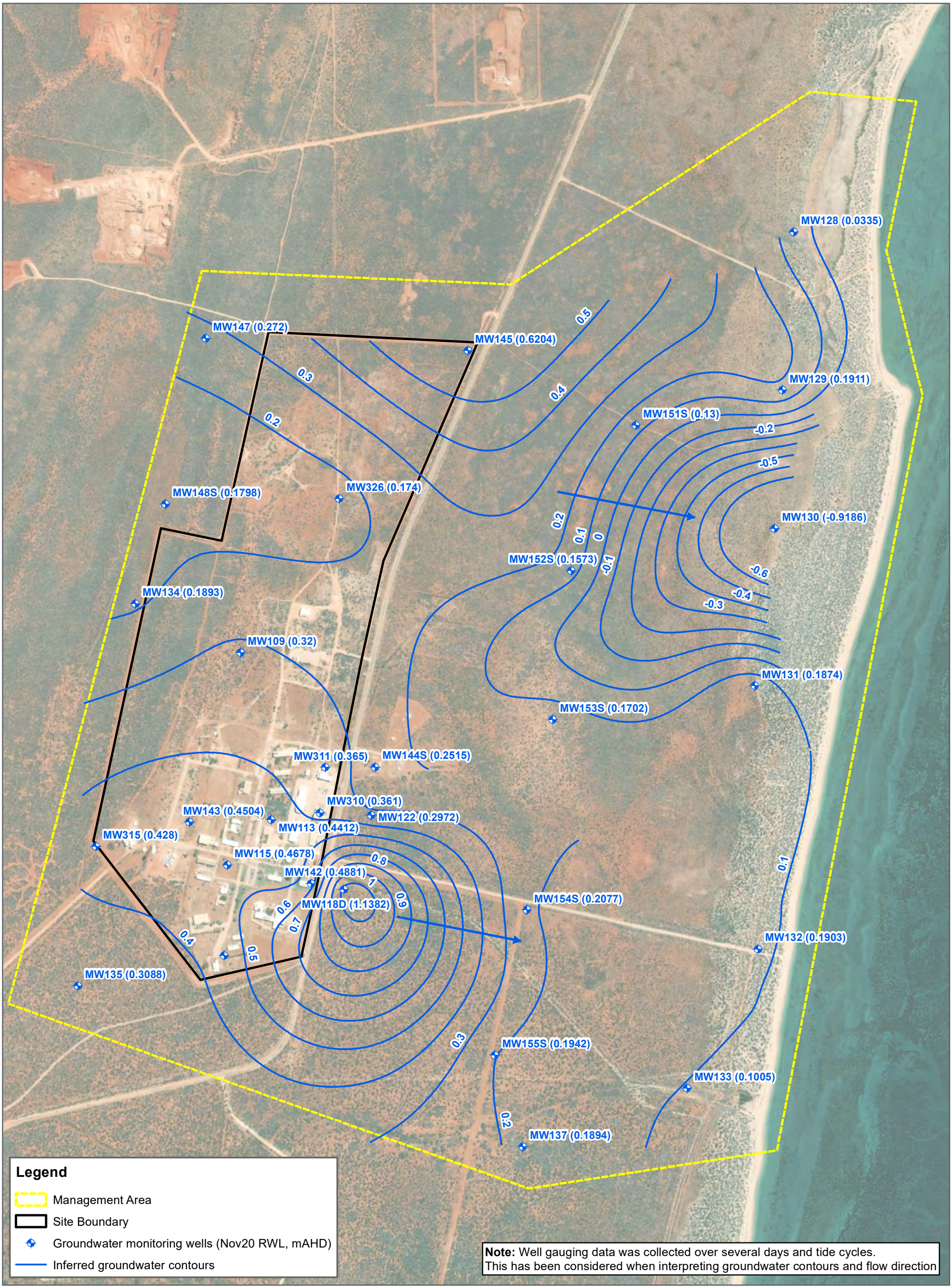

FIGURE 3

1:11,500 Scale at A3

Meters

0 250 500

Inferred Groundwater Contours

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE

N

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Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-003_GroundwaterContoursNov-20 01.mxd
Aerial Imagery Supplied by Google Earth

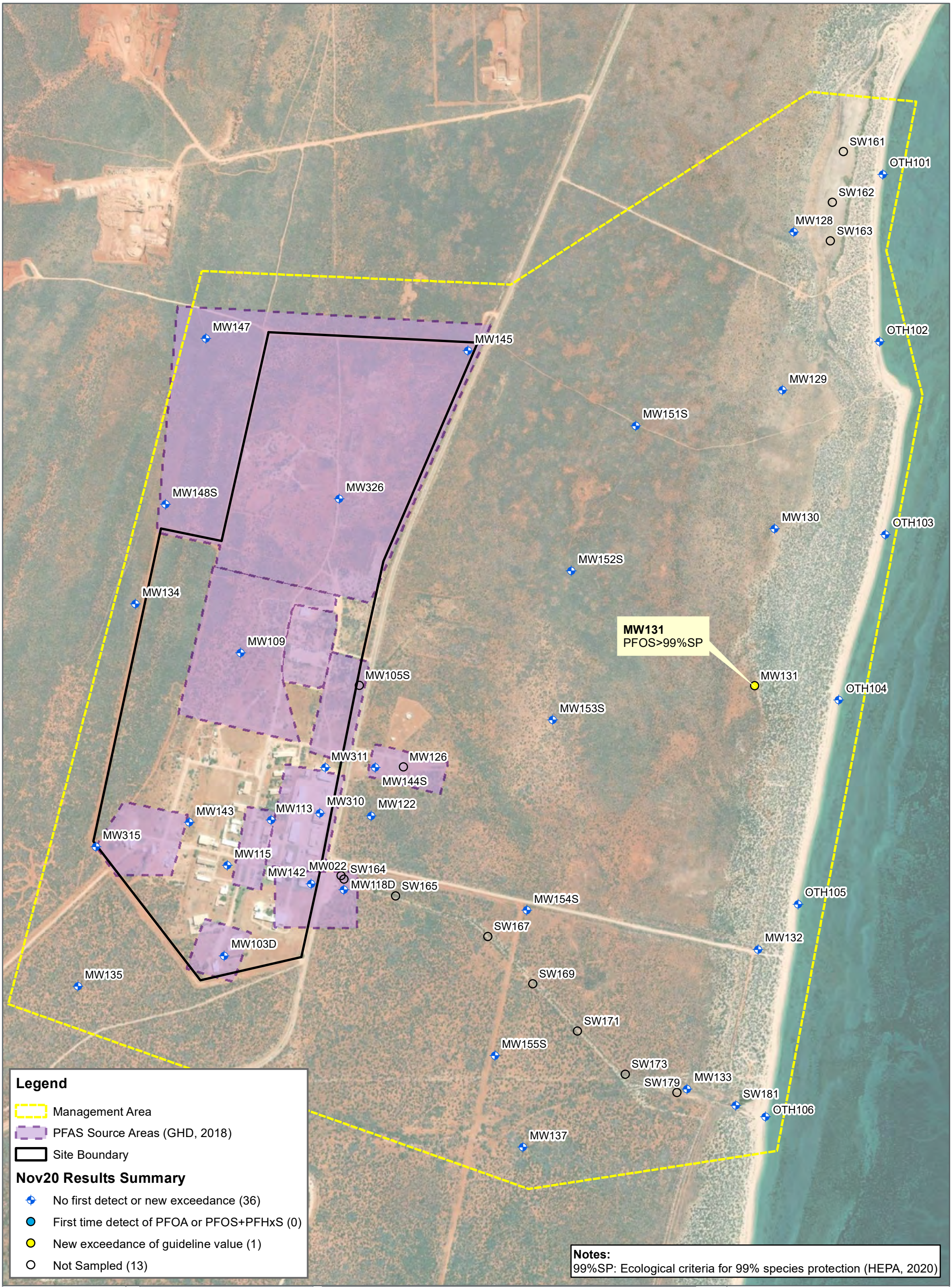

FIGURE 4

1:11,500 Scale at A3

Meters

0 250 500

Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
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Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-004_WResults_Nov20 02.mxd
Aerial Imagery Supplied by Google Earth

SS161
SS162
SS163
SS164
SS165
SS167
SS169
SS171
SS173
SS179
SS181

Legend

- Management Area
- PFAS Source Areas (GHD, 2018)
- Site Boundary

Sediment Results Summary

- No first detect or new exceedance (10)
- First time detect of PFOA or PFOS+PFHxS (0)
- New exceedance of guideline value (1)

FIGURE 5

1:11,500 Scale at A3

Meters

0 250 500

Sediment Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
DEPARTMENT OF DEFENCE

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Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0082-GS-005_SResults_Nov20 01.mxd
Aerial Imagery Supplied by Google Earth

APPENDIX

B

DATA ASSESSMENT TABLES

	Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids											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)
	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 Repoting	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	0.02	0.05	0.02	0.02	0.05	0.05	0.05	0.05
PFAS NEMP (HEPA, 2020) Human Health - NPUG and Recreational Use											10											
PFAS NEMP (HEPA, 2020) Ecological - 99% species protection					*LOR**						*19*											
Field ID	Location Code	Date																				
0082_MW103D_201117	MW103_D	17/11/2020	0.20	0.22	2.05	0.11	*4.03*	<0.02	<0.1	0.50	0.19	0.07	0.08	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.06	<0.05	<0.05
0082_MW109_201117	MW109	17/11/2020	0.64	0.90	8.10	0.25	*2.22*	<0.02	<0.1	1.21	0.19	0.07	0.18	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0082_MW113_201117	MW113	17/11/2020	0.03	0.02	0.22	<0.02	*0.06*	<0.02	<0.1	0.03	<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
0082_MW115_201117	MW115	17/11/2020	0.17	0.25	3.68	0.20	*12.2*	<0.02	1.0	2.11	2.61	0.93	0.55	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	6.08	<0.05	<0.05
0082_MW118D_201116	MW118_D	16/11/2020	0.83	0.78	6.19	0.66	*14.3*	<0.02	0.3	1.93	0.93	0.54	1.10	<0.02	<0.02	0.09	<0.05	<0.02	<0.02	<0.05	15.6	0.06	<0.05
0082_MW122_201116	MW122	16/11/2020	0.15	0.18	1.53	0.05	*0.25*	<0.02	0.1	0.55	0.33	0.21	0.16	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.10	<0.05	<0.05
0082_MW128_201116	MW128	16/11/2020	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
0082_MW129_201116	MW129	16/11/2020	<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	<0.05	<0.05	<0.05
0082_MW130_201116	MW130	16/11/2020	<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
0082_MW131_201116	MW131	16/11/2020	<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	0.06	<0.05
0082_MW132_201116	MW132	16/11/2020	<0.02	<0.02	0.04	<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
0082_MW133_201116	MW133	16/11/2020	<0.02	<0.02	<0.02	<0.02	*0.06*	<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
0082_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	<0.05	<0.05	<0.05
0082_MW135_201117	MW135	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	<0.05	<0.05	<0.05
0082_MW137_6.6_201116	MW137	16/11/2020	<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	<0.05	<0.05	<0.05
0082_MW142_201117	MW142	17/11/2020	0.03	0.05	0.74	0.06	*5.92*	<0.02	0.1	0.33	0.29	0.12	0.14	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	1.22	<0.05	<0.05
0082_MW143_201117	MW143	17/11/2020	0.04	0.05	0.53	0.11	*4.81*	<0.02	0.4	0.92	1.03	0.57	0.37	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.87	<0.05	<0.05
0082_MW144_S_201117	MW144_S	17/11/2020	0.20	0.28	2.09	0.09	*5.97*	<0.02	0.6	1.46	1.43	1.48	0.58	<0.02	<0.02	0.24	<0.05	<0.02	<0.02	<0.05	0.33	0.35	<0.05
0082_MW145_201117	MW145	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	<0.05	<0.05	<0.05
0082_MW147_201117	MW147	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	<0.05	<0.05	<0.05
0082_MW148S_201117	MW148_S	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	<0.05	<0.05	<0.05
0082_MW151_S_201116	MW151_S	16/11/2020	<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	<0.05	<0.05	<0.05
0082_MW152S_201116	MW152_S	16/11/2020	<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	<0.05	<0.05	<0.05
0082_MW153S_201116	MW153_S	16/11/2020	<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	<0.05	<0.05	<0.05
0082_MW154S_201116	MW154_S	16/11/2020	0.11	0.12	0.56	0.03	*0.73*	<0.02	<0.1	0.14	0.09	0.06	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0082_MW155S_201116	MW155_S	16/11/2020	<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	<0.05	<0.05	<0.05
0082_MW310_201117	MW310	17/11/2020	2.39	1.78	3.04	0.06	*0.65*	<0.02	1.3	7.35	3.88	0.64	0.12	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0082_MW311_201117	MW311	17/11/2020	0.03	0.04	0.36	<0.02	*0.55*	<0.02	0.2	0.35	0.48	0.12	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0082_MW315_201117	MW315	17/11/2020	<0.02	<0.02	0.02	<0.02	*0.10*	<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
0082_MW326_201117	MW326	17/11/2020	<0.02	<0.02	0.06	<0.02	*0.07*	<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
0082_OTH101_201116	OTH101	16/11/2020	<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	<0.05	<0.05	<0.05
0082_OTH102_201116	OTH102	16/11/2020	<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	<0.05	<0.05	<0.05
0082_OTH103_201116	OTH103	16/11/2020	<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	<0.05	<0.05	<0.05
0082_OTH104_201116	OTH104	16/11/2020	<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	<0.05	<0.05	<0.05
0082_OTH105_201116	OTH105	16/11/2020	<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	<0.05	<0.05	<0.05
0082_OTH106_201116	OTH106	16/11/2020	<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	<0.05	<0.05	<0.05
0082_SW181_201116	SW181	16/11/2020	<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	<0.05	<0.05	<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 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 increased.

	Perfluoroalkyl Sulfonamides							PFAS			Inorganics											
	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	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Calcium (filtered)	Chloride	Ionic Balance	Magnesium (filtered)	pH (Lab)	Potassium (filtered)
	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	mg/L	meq/L	meq/L	mg/L	mg/L	%	mg/L	pH Units	mg/L
LOR - Limit of Repoting	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01	1	1	1	1	0.01	0.01	1	1	0.01	1	0.01	1
PFAS NEMP (HEPA, 2020) Human Health - NPUG and Recreational Use									2													
PFAS NEMP (HEPA, 2020) Ecological - 99% species protection																						

Field ID	Location Code	Date																					
0082_MW103D_201117	MW103_D	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	7.18	6.08	7.51	<1	227	<1	227	61.6	58.6	288	1,900	2.54	162	7.65	31
0082_MW109_201117	MW109	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	12.6	10.3	13.8	<1	605	<1	605	112	104	66	2,960	3.74	92	7.92	105
0082_MW113_201117	MW113	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.34	0.28	0.36	<1	522	<1	522	34.3	31.4	24	703	4.46	30	8.17	40
0082_MW115_201117	MW115	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	29.3	15.9	29.8	<1	304	<1	304	52.8	50.7	109	1,440	2.06	134	7.76	91
0082_MW118D_201116	MW118_D	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	41.8	20.5	43.3	<1	657	<1	657	45.0	42.3	17	982	3.15	25	8.24	60
0082_MW122_201116	MW122	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	3.38	1.78	3.61	<1	700	<1	700	90.1	83.6	31	2,260	3.77	58	8.08	79
0082_MW128_201116	MW128	16/11/2020	<0.05	<0.12	<0.05	<0.12	<0.12	<0.05	<0.12	<0.05	<0.05	<0.05	<1	185	<1	185	625	702	540	19,800	5.79	1,550	7.71	666
0082_MW129_201116	MW129	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	156	<1	156	644	698	522	20,700	3.96	1,560	7.83	662
0082_MW130_201116	MW130	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02	0.02	<1	186	<1	186	616	634	527	19,800	1.50	1,400	7.85	568
0082_MW131_201116	MW131	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.08	0.02	0.08	<1	266	<1	266	554	591	586	17,700	3.26	1,330	7.70	519
0082_MW132_201116	MW132	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.04	0.04	0.04	<1	202	<1	202	537	580	462	17,000	3.82	1,310	7.79	552
0082_MW133_201116	MW133	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.06	0.06	0.06	<1	303	<1	303	555	611	521	17,700	4.77	1,320	7.79	586
0082_MW134_201117	MW134	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	303	<1	303	476	491	572	15,300	1.54	989	7.57	368
0082_MW135_201117	MW135	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	623	<1	623	284	278	142	7,720	1.07	415	7.94	223
0082_MW137_6.6_201116	MW137	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	450	<1	450	222	212	272	7,000	2.34	472	7.60	155
0082_MW142_201117	MW142	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	8.89	6.66	9.00	<1	358	<1	358	47.5	47.3	137	1,320	0.23	133	7.85	63
0082_MW143_201117	MW143	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	9.54	5.34	9.70	13	429	<1	442	14.0	12.5	8	156	5.61	8	8.39	32
0082_MW144_S_201117	MW144_S	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	14.5	8.06	15.1	<1	556	<1	556	28.5	24.6	18	508	7.23	10	8.09	26
0082_MW145_201117	MW145	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	248	<1	248	594	616	615	19,000	1.84	1,240	7.56	549
0082_MW147_201117	MW147	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	290	<1	290	413	422	528	13,200	1.06	894	7.54	338
0082_MW148S_201117	MW148_S	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	295	<1	295	484	492	578	15,400	0.79	1,000	7.61	392
0082_MW151_S_201116	MW151_S	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	213	<1	213	641	682	545	20,600	3.13	1,520	7.72	658
0082_MW152S_201116	MW152_S	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	182	<1	182	570	598	521	18,100	2.34	1,270	7.65	580
0082_MW153S_201116	MW153_S	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	370	<1	370	526	553	561	16,700	2.48	1,180	7.56	528
0082_MW154S_201116	MW154_S	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.74	1.29	1.89	<1	399	<1	399	252	248	274	7,690	0.75	492	7.72	223
0082_MW155S_201116	MW155_S	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	481	<1	481	276	266	338	8,730	1.98	564	7.58	198
0082_MW310_201117	MW310	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	19.4	3.69	21.2	<1	694	<1	694	49.2	47.2	34	1,020	2.12	62	8.08	58
0082_MW311_201117	MW311	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	2.14	0.91	2.18	<1	338	<1	338	8.08	7.76	25	33	2.02	13	8.19	24
0082_MW315_201117	MW315	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.12	0.12	0.12	12	689	<1	702	16.8	14.7	7	66	6.81	8	8.36	25
0082_MW326_201117	MW326	17/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.13	0.13	0.13	<1	429	<1	429	462	482	443	14,200	2.14	887	7.55	359
0082_OTH101_201116	OTH101	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	116	<1	116	644	684	475	20,500	3.02	1,540	7.88	646
0082_OTH102_201116	OTH102	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	124	<1	124	640	693	483	20,400	4.01	1,580	8.03	661
0082_OTH103_201116	OTH103	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	122	<1	122	640	692	483	20,400	3.95	1,570	8.05	657
0082_OTH104_201116	OTH104	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	127	<1	127	646	731	504	20,500	6.22	1,650	7.92	696
0082_OTH105_201116	OTH105	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	121	<1	121	642	710	498	20,400	4.98	1,610	7.97	679
0082_OTH106_201116	OTH106	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	120	<1	120	647	698	485	20,600	3.79	1,590	7.94	660
0082_SW181_201116	SW181	16/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	36	111	<1	147	2,000	2,400	1,580	64,600	9.07	5,450	8.49	2,020

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 based on typical current laborator
therefore it should be noted that warning and action levels would not be rele
limits are reduced or the screening levels increased.

							Organic
			Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	TOC	Total Suspended Solids	Dissolved Organic Carbon
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Repoting			1	1	10	1	5	1
PFAS NEMP (HEPA, 2020) Human Health - NPUG and Recreational Use								
PFAS NEMP (HEPA, 2020) Ecological - 99% species protection								
Field ID	Location Code	Date						
0082_MW103D_201117	MW103_D	17/11/2020	692	169	4,730	-	666	2
0082_MW109_201117	MW109	17/11/2020	2,080	794	6,300	-	3,190	3
0082_MW113_201117	MW113	17/11/2020	613	193	2,110	-	63,000	2
0082_MW115_201117	MW115	17/11/2020	733	294	3,010	-	912	3
0082_MW118D_201116	MW118_D	16/11/2020	870	202	2,620	1	442	-
0082_MW122_201116	MW122	16/11/2020	1,730	596	5,140	2	948	-
0082_MW128_201116	MW128	16/11/2020	12,200	3,030	42,700	14.13	67,200	-
0082_MW129_201116	MW129	16/11/2020	12,100	2,760	41,900	-	1,020	<1
0082_MW130_201116	MW130	16/11/2020	11,000	2,570	35,200	-	602	3
0082_MW131_201116	MW131	16/11/2020	10,100	2,370	35,600	-	240	6
0082_MW132_201116	MW132	16/11/2020	9,990	2,560	35,200	-	360	2
0082_MW133_201116	MW133	16/11/2020	10,600	2,390	29,200	-	112	2
0082_MW134_201117	MW134	17/11/2020	8,550	1,860	29,300	4	15,500	-
0082_MW135_201117	MW135	17/11/2020	5,310	2,580	14,800	<10	74,900	-
0082_MW137_6.6_201116	MW137	16/11/2020	3,580	760	13,800	31	1,710	-
0082_MW142_201117	MW142	17/11/2020	641	149	2,940	-	156	<1
0082_MW143_201117	MW143	17/11/2020	245	38	803	-	154	<1
0082_MW144_S_201117	MW144_S	17/11/2020	512	147	1,620	-	2,270	<1
0082_MW145_201117	MW145	17/11/2020	10,800	2,560	34,100	-	432	1
0082_MW147_201117	MW147	17/11/2020	7,210	1,690	24,500	-	2,720	2
0082_MW148S_201117	MW148_S	17/11/2020	8,520	2,100	29,100	-	2,280	1
0082_MW151_S_201116	MW151_S	16/11/2020	11,800	2,670	40,900	-	214	<1
0082_MW152S_201116	MW152_S	16/11/2020	10,400	2,700	38,100	7	1,680	-
0082_MW153S_201116	MW153_S	16/11/2020	9,520	2,280	33,700	-	1,770	3
0082_MW154S_201116	MW154_S	16/11/2020	4,320	1,280	14,800	<1	892	-
0082_MW155S_201116	MW155_S	16/11/2020	4,540	993	17,100	<1	1,050	-
0082_MW310_201117	MW310	17/11/2020	894	316	2,920	-	711	3
0082_MW311_201117	MW311	17/11/2020	111	19	453	-	452	2
0082_MW315_201117	MW315	17/11/2020	300	46	941	-	556	2
0082_MW326_201117	MW326	17/11/2020	8,680	2,520	26,400	-	2,400	2
0082_OTH101_201116	OTH101	16/11/2020	11,900	3,070	44,000	-	442	1
0082_OTH102_201116	OTH102	16/11/2020	12,000	2,960	42,700	-	972	2
0082_OTH103_201116	OTH103	16/11/2020	12,000	2,960	43,800	-	1,070	1
0082_OTH104_201116	OTH104	16/11/2020	12,700	3,110	43,700	-	1,070	<1
0082_OTH105_201116	OTH105	16/11/2020	12,300	3,100	43,700	-	437	1
0082_OTH106_201116	OTH106	16/11/2020	12,100	3,060	43,700	-	426	1
0082_SW181_201116	SW181	16/11/2020	41,900	8,500	140,000	-	66	16

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 based on typical current laborator
therefore it should be noted that warning and action levels would not be rele
limits are reduced or the screening levels increased.

	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 Repoting	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) Human Health - Commercial / Industrial Use											50										
PFAS NEMP (HEPA, 2020) Ecological - Direct exposure (interim guidelines)					*1.0*						*10*										
PFAS NEMP (HEPA, 2020) Ecological - Indirect exposure (interim guidelines)					0.01																
Field ID	Location Code	Date																				
0082_SD161_0.00-0.10_201116	SS161	16/11/2020	<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
0082_SD162_201116	SS162	16/11/2020	<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
0082_SD163_201116	SD163	16/11/2020	<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
0082_SD164_201116	SS164	16/11/2020	<0.0002	<0.0002	0.0002	<0.0002	0.0345	<0.0002	<0.001	0.0008	0.0007	0.0003	0.0004	<0.0002	<0.0002	0.0004	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	0.0026	<0.0005
0082_SD181_201116	SD181	16/11/2020	<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
0082_SS165_201116	SS165	16/11/2020	<0.0002	<0.0002	0.0008	<0.0002	0.0083	0.0015	<0.001	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	0.0002	<0.0002	<0.0005	<0.0002	0.0002	<0.0005	<0.0005	0.0007	<0.0005
0082_SS167_201116	SS167	16/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0024	0.0011	<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
0082_SS169_201116	SS169	16/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0016	<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
0082_SS171_201116	SS171	16/11/2020	<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
0082_SS173_201116	SS173	16/11/2020	<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
0082_SS179_201116	SS179	16/11/2020	<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

Notes:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value
LOR: Limit of Repoting

			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	meq/100g	µS/cm	pH Units	%
LOR - Limit of Repoting			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) Human Health - Commercial / Industrial Use										20											
PFAS NEMP (HEPA, 2020) Ecological - Direct exposure (interim guidelines)																					
PFAS NEMP (HEPA, 2020) Ecological - Indirect exposure (interim guidelines)																					
Field ID	Location Code	Date																			
0082_SD161_0.00-0.10_201116	SS161	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.7	30.6	7.6	0.3	0.7	39.2	25,800	8.8	5.5
0082_SD162_201116	SS162	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.9	18.6	7.6	0.4	0.8	27.4	18,100	8.9	1.1
0082_SD163_201116	SD163	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	5.1	21.7	10.4	0.6	1.8	34.6	32,400	8.4	5.7
0082_SD164_201116	SS164	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0395	0.0347	0.0399	2.7	8.5	0.6	0.5	0.3	9.9	81	9.2	0.7
0082_SD181_201116	SD181	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	71.4	9.1	17.3	2.6	72.2	101	18	8.7	1.8
0082_SS165_201116	SS165	16/11/2020	0.0002	<0.0005	0.0005	<0.0005	<0.0005	0.0004	<0.0005	0.0103	0.0091	0.0133	1.6	10.1	1.6	0.7	0.2	12.6	195	7.3	5.0
0082_SS167_201116	SS167	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0024	0.0024	0.0035	2.5	5.4	0.4	0.3	0.2	6.2	61	8.7	0.8
0082_SS169_201116	SS169	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0016	0.0016	0.0016	4.3	6.6	0.7	0.3	0.3	8.0	97	9.0	1.5
0082_SS171_201116	SS171	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	3.2	9.8	0.7	0.2	0.4	11.0	119	9.1	0.8
0082_SS173_201116	SS173	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0002	0.0002	0.0002	3.4	14.0	3.2	0.5	0.6	18.3	108	9.0	1.9
0082_SS179_201116	SS179	16/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	26.6	6.0	1.7	0.1	2.8	10.7	3	8.6	1.8

Notes:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value
LOR: Limit of Repoting

	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)
	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	0.02	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
Field ID	Date	Sample Type																				
0082_QC301_201116	16/11/2020	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	<0.05	<0.05	<0.05	<0.05
0082_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	<0.05	<0.05	<0.05	<0.05
0082_QC302_201116	16/11/2020	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	<0.05	<0.05	<0.05	<0.05
0082_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	<0.05	<0.05	<0.05	<0.05
0082_QC303_201116	16/11/2020	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	<0.05	<0.05	<0.05	<0.05
0082_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	<0.05	<0.05	<0.05	<0.05
0082_QC401_201116	16/11/2020	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	<0.05	<0.05	<0.05	<0.05
0082_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	<0.05	<0.05	<0.05	<0.05
0082_QC402_201116	16/11/2020	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	<0.05	<0.05	<0.05	<0.05
0082_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	<0.05	<0.05	<0.05	<0.05
0082_QC403_201116	16/11/2020	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	<0.05	<0.05	<0.05	<0.05
0082_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	<0.05	<0.05	<0.05	<0.05

			Perfluoroalkyl Sulfonamides							PFAS		
			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
LOR - Limit of Reporting			0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
Field ID	Date	Sample Type										
0082_QC301_201116	16/11/2020	Rinsate	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC301_201117	17/11/2020	Rinsate	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC302_201116	16/11/2020	Rinsate	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC302_201117	17/11/2020	Rinsate	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC303_201116	16/11/2020	Rinsate	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC303_201117	17/11/2020	Rinsate	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC401_201116	16/11/2020	Field_B	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC401_201117	17/11/2020	Field_B	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC402_201116	16/11/2020	Field_B	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC402_201117	17/11/2020	Field_B	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC403_201116	16/11/2020	Field_B	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0082_QC403_201117	17/11/2020	Field_B	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Lab Report Number			EP2012672	EP2012740		EP2012672	758013		EP2012739	EP2012739		EP2012739	758013		EP2012738	EP2012738	
Field ID			0082_SW181_201116	0082_QC102_201117		0082_SW181_201116	0082_QC202_201117		0082_MW144_S_20111	0082_QC103_201117		0082_MW144_S_20111	0082_QC204_201117		0082_MW326_201117	0082_QC104_201117	
Date			16/11/2020	17/11/2020		16/11/2020	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	Water	RPD
	Unit	LOR															
Perfluoroalkane Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	0.06	-	-	-	-
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.20	0.20	0	0.20	0.18	11	<0.02	<0.02	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.28	0.29	4	0.28	0.23	20	<0.02	<0.02	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	0.07	111	2.09	2.10	0	2.09	5.0	82	0.06	0.05	18
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.09	0.10	11	0.09	0.09	0	<0.02	<0.02	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	5.97	6.88	14	5.97	5.9	1	0.07	0.04	55
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	0.02	-	-	-	-
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	<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	0.6	0.6	0	0.6	0.63	5	<0.1	<0.1	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	0.02	0	1.46	1.44	1	1.46	1.4	4	<0.02	<0.02	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	0.02	0	1.43	1.46	2	1.43	1.4	2	<0.02	<0.02	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	0.03	40	1.48	1.46	1	1.48	1.4	6	<0.02	<0.02	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	0.58	0.59	2	0.58	0.43	30	<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	<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	<0.01	0	<0.02	<0.02	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.24	0.26	8	0.24	0.21	13	<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	<0.01	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	<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	<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	<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	0.33	0.33	0	0.33	0.24	32	<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	0.35	0.37	6	0.35	0.13	92	<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	<0.01	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	<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	<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	<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	<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	<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	<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	<0.05	<0.05	0
PFAS																	
Sum of PFAS (WA DER List)_	µg/L	0.01	<0.01	<0.01	0	<0.01	0.14	173	14.5	15.4	6	14.5	16.71	14	0.13	0.09	36
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	0.07	150	8.06	8.98	11	8.06	10.9	30	0.13	0.09	36
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	0.14	173	15.1	16.1	6	15.1	17.32	14	0.13	0.09	36
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	-	-	-	0.07	-	-	-	-	-	11.33	-	-	-	-
Inorganics																	
Carbonate Alkalinity (as CaCO3)	mg/L	1	36	<1	189	36	<10	113	<1	<1	0	<1	<10	0	<1	<1	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	111	162	37	111	180	47	556	591	6	556	710	24	429	388	10
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0	<1	<1	0
Alkalinity (total) as CaCO3	mg/L	1	147	162	10	147	180	20	556	591	6	556	710	24	429	388	10
Anions Total	meq/L	0.01	2,000	1,800	11	2,000	-	-	28.5	29.2	2	28.5	-	-	462	468	1
Cations Total	meq/L	0.01	2,400	2,120	12	2,400	-	-	24.6	25.0	2	24.6	-	-	482	461	4
Calcium	mg/L	0.5	-	-	-	-	1,700	-	-	-	-	-	260	-	-	-	-
Calcium (filtered)	mg/L	1	1,580	1,410	11	1,580	-	-	18	18	0	18	-	-	443	435	2
Chloride	mg/L	1	64,600	57,800	11	64,600	73,000	12	508	510	0	508	16,000	188	14,200	14,400	1
Ionic Balance	%	0.01	9.07	8.06	12	9.07	-	-	7.23	7.68	6	7.23	-	-	2.14	0.80	91
Magnesium	mg/L	0.5	-	-	-	-	4,600	-	-	-	-	-	680	-	-	-	-
Magnesium (filtered)	mg/L	1	5,450	4,720	14	5,450	-	-	10	10	0	10	-	-	887	860	3
pH (Lab)	pH Units	0.01	8.49	7.98	6	8.49	7.9	7	8.09	8.16	1	8.09	8.0	1	7.55	7.51	1
Potassium	mg/L	0.5	-	-	-	-	1,700	-	-	-	-	-	190	-	-	-	-
Potassium (filtered)	mg/L	1	2,020	2,220	9	2,020	-	-	26	26	0	26	-	-	359	346	4
Sodium	mg/L	0.5	-	-	-	-	37,000	-	-	-	-	-	8,000	-	-	-	-
Sodium (filtered)	mg/L	1	41,900	36,800	13	41,900	-	-	512	521	2	512	-	-	8,680	8,260	5
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	8,500	8,020	6	8,500	-	-	147	145	1	147	-	-	2,520	2,600	3
Sulphate	mg/L	5	-	-	-	-	9,400	-	-	-	-	-	3,000	-	-	-	-
TDS	mg/L	10	140,000	118,000	17	140,000	1,200	197	1,620	1,620	0	1,620	23,000	174	26,400	26,800	2
TOC	mg/L	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	66	51	26	66	600	160	2,270	1,900	18	2,270	800	96	2,400	8,370	111
Organic																	
Dissolved Organic Carbon	mg/L	1	16	16	0	16	-	-	<1	1	0	<1	-	-	2	7	111
Dissolved Organic Carbon (filtered)	mg/L	5	-	-	-	-	17	-	-	-	-	-	<5	-	-	-	-

LOR: Limit of Reporting

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

Lab Report Number		EP2012672	EP2012740		EP2012672	758013		EP2012739	EP2012739		EP2012739	758013		EP2012738	EP2012738	
Field ID		0082_SW181_201116	0082_QC102_201117		0082_SW181_201116	0082_QC202_201117		0082_MW144_S_20111	0082_QC103_201117		0082_MW144_S_20111	0082_QC204_201117		0082_MW326_201117	0082_QC104_201117	
Date		16/11/2020	17/11/2020		16/11/2020	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	Water	RPD
	Unit	LOR														

**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			EP2012738	758013		EP2012748	EP2012748		EP2012748	758013		EP2012738	EP2012738		EP2012738	758013	
Field ID			0082_MW326_201117	0082_QC203_201117		0082_MW134_201117	0082_QC105_201117		0082_MW134_201117	0082_QC205_201117		0082_MW113_201117	0082_QC106_201117		0082_MW113_201117	0082_QC206_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	17/11/2020	
Matrix Type			Water	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	<0.02	0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	0.03	0.03	0	0.03	0.02	40
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	0.02	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.06	0.08	29	<0.02	<0.02	0	<0.02	0.14	150	0.22	0.22	0	0.22	0.36	48
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	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.07	<0.01	150	<0.01	<0.01	0	<0.01	0.03	100	0.06	0.07	15	0.06	0.03	67
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	<0.02	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	<0.1	<0.05	0	<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	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	0.03	0.03	0	0.03	0.02	40
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	0.02	0
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	<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	<0.01	<0.01	0
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	<0.01	0
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	<0.01	0
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	<0.01	0
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	<0.01	0
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	<0.01	0
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	<0.01	0
(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	<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	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	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	<0.01	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	<0.02	<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	<0.05	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	<0.02	<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	<0.05	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	<0.05	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	<0.02	<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	<0.05	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	0.13	0.09	36	<0.01	<0.01	0	<0.01	0.17	178	0.34	0.35	3	0.34	0.45	28
Sum of PFHxS and PFOS	µg/L	0.01	0.13	0.08	48	<0.01	<0.01	0	<0.01	0.17	178	0.28	0.29	4	0.28	0.39	33
Sum of PFAS	µg/L	0.01	0.13	<0.1	26	<0.01	<0.01	0	<0.01	0.18	179	0.36	0.37	3	0.36	0.47	27
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	0.08	-	-	-	-	-	0.17	-	-	-	-	-	0.39	-
Inorganics																	
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	17	178	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	429	2,300	137	303	329	8	303	410	30	522	579	10	522	1,800	110
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<20	0	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1	429	2,400	139	303	329	8	303	410	30	522	579	10	522	1,800	110
Anions Total	meq/L	0.01	462	-	-	476	472	1	476	-	-	34.3	36.0	5	34.3	-	-
Cations Total	meq/L	0.01	482	-	-	491	487	1	491	-	-	31.4	31.3	0	31.4	-	-
Calcium	mg/L	0.5	-	9.3	-	-	-	-	-	420	-	-	-	-	-	15	-
Calcium (filtered)	mg/L	1	443	-	-	572	572	0	572	-	-	24	23	4	24	-	-
Chloride	mg/L	1	14,200	620	183	15,300	15,100	1	15,300	16,000	4	703	725	3	703	800	13
Ionic Balance	%	0.01	2.14	-	-	1.54	1.61	4	1.54	-	-	4.46	7.07	45	4.46	-	-
Magnesium	mg/L	0.5	-	5.1	-	-	-	-	-	840	-	-	-	-	-	29	-
Magnesium (filtered)	mg/L	1	887	-	-	989	983	1	989	-	-	30	30	0	30	-	-
pH (Lab)	pH Units	0.01	7.55	8.4	11	7.57	7.59	0	7.57	7.9	4	8.17	8.21	0	8.17	8.6	5
Potassium	mg/L	0.5	-	18	-	-	-	-	-	220	-	-	-	-	-	31	-
Potassium (filtered)	mg/L	1	359	-	-	368	362	2	368	-	-	40	39	3	40	-	-
Sodium	mg/L	0.5	-	530	-	-	-	-	-	8,000	-	-	-	-	-	620	-
Sodium (filtered)	mg/L	1	8,680	-	-	8,550	8,470	1	8,550	-	-	613	613	0	613	-	-
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	2,520	-	-	1,860	1,880	1	1,860	-	-	193	193	0	193	-	-
Sulphate	mg/L	5	-	170	-	-	-	-	-	2,100	-	-	-	-	-	220	-
TDS	mg/L	10	26,400	1,300	181	29,300	28,400	3	29,300	27,000	8	2,110	2,120	0	2,110	1,900	10
TOC	mg/L	1	-	-	-	4	<2	67	4	-	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	2,400	2,100	13	15,500	16,100	4	15,500	590	185	63,000	74,500	17	63,000	6,100	165
Organic																	
Dissolved Organic Carbon	mg/L	1	2	-	-	-	-	-	-	-	-	2	3	40	2	-	-
Dissolved Organic Carbon (filtered)	mg/L	5	-	<5	-	-	-	-	-	<5	-	-	-	-	-	<5	-

LOR: Limit of Reporting

*RPDs have only been considered where a concentration is greater than 1 ti

Table 4 - Relative Percentage Difference Results (Water)

Lab Report Number		EP2012738	758013		EP2012748	EP2012748		EP2012748	758013		EP2012738	EP2012738		EP2012738	758013	
Field ID		0082_MW326_201117	0082_QC203_201117		0082_MW134_201117	0082_QC105_201117		0082_MW134_201117	0082_QC205_201117		0082_MW113_201117	0082_QC106_201117		0082_MW113_201117	0082_QC206_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	17/11/2020	
Matrix Type		Water	Water	RPD	Water	Water	RPD	Water	Water	RPD	Water	Water	RPD	Water	Water	RPD
	Unit	LOR														

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable R

***Interlab Duplicates are matched on a per compound basis as methods va

Lab Report Number		EP2012674	EP2012674	RPD	EP2012674	758013	RPD
Field ID		0082_SD163_201116	0082_QC101_201116		0082_SD163_201116	0082_QC201_201116	
Date		16/11/2020	16/11/2020		16/11/2020	16/11/2020	
Matrix Type		Soil	Soil		Soil	Soil	
	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	-	-	-	-	21,000	-
Exchangeable Sodium Percent	%	0.1	5.1	4.2	19	5.1	-	-
pH (1:5 Aqueous extract at 25Â°C as rec.)	pH Units	0.1	-	-	-	-	8.6	-
Exchangeable Calcium	meq/100g	0.1	21.7	23.4	8	21.7	-	-
Exchangeable Magnesium	meq/100g	0.1	10.4	8.7	18	10.4	-	-
Exchangeable Potassium	meq/100g	0.1	0.6	0.5	18	0.6	-	-
Exchangeable Sodium	meq/100g	0.1	1.8	1.4	25	1.8	-	-
CEC	meq/100g	0.05	34.6	34.2	1	34.6	110	104
Electrical conductivity *(lab)	µS/cm	1	32,400	18,700	54	32,400	-	-
pH (Lab)	pH Units	0.1	8.4	8.6	2	8.4	-	-
TOC	mg/kg	1,000	-	-	-	-	21,000	-
Organic								
Organic Matter	%	0.5	5.7	3.5	48	5.7	-	-

LOR: Limit of Reporting

*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 9300 5400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
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07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
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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-B	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	DEF19009/630				
Quote ID №					

Sampler(s)	
Handed over by	ALS
Email for Invoice	claire.armstrong@cardno.com.au
Email for Results	maelle.bourdais@cardno.com.au derp.labreports@esdat.com.au

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	0082_QC201_201117	16/11/20	S	X			X									
2	0082_QC202_201117	17/11/20	W	X	X	X										
3	0082_QC203_201117		W	X	X	X										
4	0082_QC204_201117		W	X	X	X										
5	0082_QC205_201117		W	X	X	X										
6	0082_QC206_201117		W	X	X	X										
7																
8																
9																
10																
	Total Counts															

Date/Time: 19/11/20 10:37
Chilled: (Yes) No
Temp: 15.3 / 10.8 / 13.5
Correction: -1.4
Final Temp: 11.8°C

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	19/10/20	Time 10:37
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date		Time

Temperature: 11.8°C
Report №: 758013

WS0009_R10 Modified by: Dr. R Symons Approved by: G Jackson Approved on: 6 August 2019

eurofins | Environment Testing

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IANZ # 1327

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Rolleston, Christchurch 7675
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IANZ # 1290

Sample Receipt Advice

Company name:	Cardno (WA)
Contact name:	David James
Project name:	HEH-B
Project ID:	WA_0082_PFASOMP
Turnaround time:	5 Day
Date/Time received	Nov 19, 2020 10:37 AM
Eurofins reference	758013

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-B
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/330
Report #: 758013
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_201116	Nov 16, 2020		Soil	P20-No33963		X		X		X	X		X		
2	0083_QC202_201117	Nov 17, 2020		Water	P20-No33964	X		X		X			X	X	X	X
3	0083_QC203_201117	Nov 17, 2020		Water	P20-No33965	X		X		X			X	X	X	X
4	0083_QC204_201117	Nov 17, 2020		Water	P20-No33966	X		X		X			X	X	X	X
5	0083_QC205_201117	Nov 17, 2020		Water	P20-No33967	X		X		X			X	X	X	X
6	0083_QC206_	Nov 17, 2020		Water	P20-No33968	X		X		X			X	X	X	X

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Project Name: HEH-B
Project ID: WA_0082_PFASOMP

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Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 19, 2020 10:37 AM
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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 **758013-S**
Project name HEH-B
Project ID WA_0082_PFASOMP
Received Date Nov 19, 2020

Client Sample ID			**0083_QC201_201116**
Sample Matrix			**Soil**
Eurofins Sample No.			**P20-No33963**
Date Sampled			**Nov 16, 2020**
Test/Reference	LOR	Unit	
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	21000
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.6
Total Organic Carbon	0.1	%	2.1
% Moisture	1	%	34
Cation Exchange Capacity			
Cation Exchange Capacity	0.05	meq/100g	110
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	%	18
13C5-PFPeA (surr.)	1	%	31
13C5-PFHxA (surr.)	1	%	30
13C4-PFHpA (surr.)	1	%	45
13C8-PFOA (surr.)	1	%	56
13C5-PFNA (surr.)	1	%	65
13C6-PFDA (surr.)	1	%	69
13C2-PFUnDA (surr.)	1	%	87
13C2-PFDoDA (surr.)	1	%	78
13C2-PFTeDA (surr.)	1	%	42
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_201116
Sample Matrix			**Soil**
Eurofins Sample No.			**P20-No33963**
Date Sampled			**Nov 16, 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	%	75
D3-N-MeFOSA (surr.)	1	%	60
D5-N-EtFOSA (surr.)	1	%	75
D7-N-MeFOSE (surr.)	1	%	63
D9-N-EtFOSE (surr.)	1	%	66
D5-N-EtFOSAA (surr.)	1	%	62
D3-N-MeFOSAA (surr.)	1	%	58
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	%	74
18O2-PFHxS (surr.)	1	%	78
13C8-PFOS (surr.)	1	%	89
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	%	12
13C2-6:2 FTSA (surr.)	1	%	22
13C2-8:2 FTSA (surr.)	1	%	28
13C2-10:2 FTSA (surr.)	1	%	38
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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Order No.: DEF19009/330
Report #: 758013
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_201116	Nov 16, 2020		Soil	P20-No33963		X		X		X	X		X		
2	0083_QC202_201117	Nov 17, 2020		Water	P20-No33964	X		X		X			X	X	X	X
3	0083_QC203_201117	Nov 17, 2020		Water	P20-No33965	X		X		X			X	X	X	X
4	0083_QC204_201117	Nov 17, 2020		Water	P20-No33966	X		X		X			X	X	X	X
5	0083_QC205_201117	Nov 17, 2020		Water	P20-No33967	X		X		X			X	X	X	X
6	0083_QC206_	Nov 17, 2020		Water	P20-No33968	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							
Total Organic Carbon	%	100			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	108			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	100			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	108			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoroheptanoic acid (PFHpA)	%	107			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	80			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	102			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	107			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	120			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	112			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	132			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	103			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	110			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	118			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	141			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	120			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	101			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	98			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	116			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	100			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	123			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	121			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	94			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	144			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	109			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	104			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	112			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	121			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	123			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	110			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	99			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)	S20-No27816	NCP	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S20-No27816	NCP	%	80			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S20-No27816	NCP	%	85			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-No27816	NCP	%	88			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S20-No27816	NCP	%	65			50-150	Pass	
Perfluorononanoic acid (PFNA)	S20-No27816	NCP	%	84			50-150	Pass	
Perfluorodecanoic acid (PFDA)	S20-No27816	NCP	%	82			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-No27816	NCP	%	106			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-No27816	NCP	%	99			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-No27816	NCP	%	96			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-No27816	NCP	%	76			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	S20-No27816	NCP	%	83			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)	S20-No27816	NCP	%	82			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-No27816	NCP	%	89			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-No27816	NCP	%	96			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-No27816	NCP	%	96			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-No27816	NCP	%	79			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-No27816	NCP	%	89			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S20-No27816	NCP	%	76			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-No27816	NCP	%	98			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-No27816	NCP	%	85			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-No27816	NCP	%	77			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-No27816	NCP	%	118			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-No27816	NCP	%	84			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-No27816	NCP	%	79			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-No27816	NCP	%	90			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-No27816	NCP	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-No27816	NCP	%	115			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-No27816	NCP	%	96			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-No27816	NCP	%	87			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-No36002	NCP	uS/cm	31	30	3.0	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	M20-No36002	NCP	pH Units	8.1	8.0	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)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorononanoic acid (PFNA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-No27343	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-No27343	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-No27343	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)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-No27343	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-No27343	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-No27343	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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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 **758013-W**
Project name HEH-B
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-No33964**	**P20-No33965**	**P20-No33966**	**P20-No33967**
Date Sampled			**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**	**Nov 17, 2020**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	73000	620	16000	16000
Dissolved Organic Carbon	5	mg/L	17	< 5	< 5	< 5
pH (at 25 °C)	0.1	pH Units	7.9	8.4	8.0	7.9
Sulphate (as SO4)	5	mg/L	9400	170	3000	2100
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	1200	1300	23000	27000
Total Suspended Solids Dried at 103–105°C	1	mg/L	600	2100	800	590
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	180	2300	710	410
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	17	< 10	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	< 20	< 20
Total Alkalinity (as CaCO3)	20	mg/L	180	2400	710	410
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	0.5	mg/L	1700	9.3	260	420
Magnesium	0.5	mg/L	4600	5.1	680	840
Potassium	0.5	mg/L	1700	18	190	220
Sodium	0.5	mg/L	37000	530	8000	8000
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	< 0.05	0.63	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.02	< 0.01	1.4	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	0.02	< 0.01	1.4	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	0.03	< 0.01	1.4	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	< 0.01	[N09]0.43	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	< 0.01	0.21	< 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	%	85	84	74	95
13C5-PFPeA (surr.)	1	%	65	64	142	69
13C5-PFHxA (surr.)	1	%	96	101	143	96
13C4-PFHpA (surr.)	1	%	98	99	126	93
13C8-PFOA (surr.)	1	%	93	91	69	89
13C5-PFNA (surr.)	1	%	39	46	79	48
13C6-PFDA (surr.)	1	%	89	90	63	96

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-No33964	P20-No33965	P20-No33966	P20-No33967
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	%	114	120	125	122
13C2-PFDoDA (surr.)	1	%	57	97	99	96
13C2-PFTeDA (surr.)	1	%	32	67	61	62
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	%	62	97	101	98
D3-N-MeFOSA (surr.)	1	%	42	61	57	50
D5-N-EtFOSA (surr.)	1	%	36	55	50	43
D7-N-MeFOSE (surr.)	1	%	56	94	94	86
D9-N-EtFOSE (surr.)	1	%	56	105	100	92
D5-N-EtFOSAA (surr.)	1	%	56	77	70	70
D3-N-MeFOSAA (surr.)	1	%	56	66	64	66
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01	0.01	0.18	< 0.01
Perfluorononanesulfonic acid (PFNS)[N15]	0.01	ug/L	< 0.01	< 0.01	[N09]0.02	< 0.01
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.01	ug/L	< 0.01	< 0.01	0.06	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	< 0.01	[N09]0.23	[N09]0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]0.07	[N09]0.08	[N09]5.0	[N09]0.14
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	< 0.01	[N09]0.09	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01	< 0.01	[N09]5.9	[N09]0.03
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	90	90	81	96
18O2-PFHxS (surr.)	1	%	124	124	112	128
13C8-PFOS (surr.)	1	%	113	125	108	132
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	0.24	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	< 0.01	0.13	< 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	%	105	73	113	87
13C2-6:2 FTSA (surr.)	1	%	123	75	105	75
13C2-8:2 FTSA (surr.)	1	%	80	65	73	62
13C2-10:2 FTSA (surr.)	1	%	49	56	61	50

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-No33964**	**P20-No33965**	**P20-No33966**	**P20-No33967**
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	0.07	0.08	10.9	0.17
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01	6.33	0.03
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.07	0.08	11.33	0.17
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.14	0.09	16.71	0.17
Sum of PFASs (n=30)*	0.1	ug/L	0.14	< 0.1	17.32	0.18

Client Sample ID			0083_QC206_201117
Sample Matrix			**Water**
Eurofins Sample No.			**P20-No33968**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
Chloride	1	mg/L	800
Dissolved Organic Carbon	5	mg/L	< 5
pH (at 25 °C)	0.1	pH Units	8.6
Sulphate (as SO4)	5	mg/L	220
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	1900
Total Suspended Solids Dried at 103–105°C	1	mg/L	6100
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	1800
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20
Total Alkalinity (as CaCO3)	20	mg/L	1800
Eurofins Suite B11C: Na/K/Ca/Mg			
Calcium	0.5	mg/L	15
Magnesium	0.5	mg/L	29
Potassium	0.5	mg/L	31
Sodium	0.5	mg/L	620
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	0.02
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	0.02
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 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	%	92
13C5-PFPeA (surr.)	1	%	74
13C5-PFHxA (surr.)	1	%	83
13C4-PFHpA (surr.)	1	%	82
13C8-PFOA (surr.)	1	%	71
13C5-PFNA (surr.)	1	%	45
13C6-PFDA (surr.)	1	%	79

Client Sample ID			0083_QC206_201117
Sample Matrix			**Water**
Eurofins Sample No.			**P20-No33968**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
13C2-PFUnDA (surr.)	1	%	124
13C2-PFDoDA (surr.)	1	%	107
13C2-PFTeDA (surr.)	1	%	99
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	%	92
D3-N-MeFOSA (surr.)	1	%	98
D5-N-EtFOSA (surr.)	1	%	92
D7-N-MeFOSE (surr.)	1	%	102
D9-N-EtFOSE (surr.)	1	%	118
D5-N-EtFOSAA (surr.)	1	%	70
D3-N-MeFOSAA (surr.)	1	%	60
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]0.02
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	[N09]0.36
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.03
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	81
18O2-PFHxS (surr.)	1	%	102
13C8-PFOS (surr.)	1	%	120
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 FTSA (surr.)	1	%	82
13C2-6:2 FTSA (surr.)	1	%	65
13C2-8:2 FTSA (surr.)	1	%	51
13C2-10:2 FTSA (surr.)	1	%	62

Client Sample ID			0083_QC206_201117
Sample Matrix			**Water**
Eurofins Sample No.			**P20-No33968**
Date Sampled			**Nov 17, 2020**
Test/Reference	LOR	Unit	
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	0.39
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.03
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.39
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.45
Sum of PFASs (n=30)*	0.1	ug/L	0.47

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	Nov 20, 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)			

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Project Name: HEH-B
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/330
Report #: 758013
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_201116	Nov 16, 2020		Soil	P20-No33963		X		X		X	X		X		
2	0083_QC202_201117	Nov 17, 2020		Water	P20-No33964	X		X		X			X	X	X	X
3	0083_QC203_201117	Nov 17, 2020		Water	P20-No33965	X		X		X			X	X	X	X
4	0083_QC204_201117	Nov 17, 2020		Water	P20-No33966	X		X		X			X	X	X	X
5	0083_QC205_201117	Nov 17, 2020		Water	P20-No33967	X		X		X			X	X	X	X
6	0083_QC206_	Nov 17, 2020		Water	P20-No33968	X		X		X			X	X	X	X

eurofins | Environment Testing

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Company Name: Cardno (WA)
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West Perth
WA 6005

Project Name: HEH-B
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/330
Report #: 758013
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	
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	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Chloride	%	96			70-130	Pass	
Sulphate (as SO4)	%	109			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	98			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	80			70-130	Pass	
Total Alkalinity (as CaCO3)	%	85			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	96			80-120	Pass	
Magnesium	%	89			80-120	Pass	
Potassium	%	84			80-120	Pass	
Sodium	%	89			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	M20-No28798	NCP	%	79			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	S20-No33521	NCP	%	103			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	
Perfluorohexanesulfonic acid (PFHxS)	S20-No32944	NCP	%	109			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-No32944	NCP	%	74			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
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									
				Result 1					
Sulphate (as SO4)	P20-No31778	NCP	%	95			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Magnesium	P20-No33965	CP	%	105			75-125	Pass	
Potassium	P20-No33965	CP	%	88			75-125	Pass	
Sodium	P20-No33965	CP	%	107			75-125	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Bicarbonate Alkalinity (as CaCO3)	M20-No42436	NCP	%	81			70-130	Pass	
Total Alkalinity (as CaCO3)	P20-No44199	NCP	%	111			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	P20-No33912	NCP	mg/L	12000	15000	29	30%	Pass	
Dissolved Organic Carbon	S20-No41471	NCP	mg/L	12	12	2.0	30%	Pass	
pH (at 25 °C)	M20-No35853	NCP	pH Units	6.3	6.3	pass	30%	Pass	
Sulphate (as SO4)	P20-No33912	NCP	mg/L	1600	1600	4.0	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	P20-No33908	NCP	mg/L	29000	28000	5.9	30%	Pass	
Total Suspended Solids Dried at 103–105°C	B20-No32960	NCP	mg/L	170	140	18	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M20-No35843	NCP	mg/L	400	330	18	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M20-No35843	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	M20-No35843	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M20-No35843	NCP	mg/L	400	330	18	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	

Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluoroundecanoic acid (PFUnDA)	S20-No32943	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
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									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	P20-No33965	CP	mg/L	9.3	12	23	30%	Pass	
Magnesium	P20-No33965	CP	mg/L	5.1	9.1	56	30%	Fail	Q02
Potassium	P20-No33965	CP	mg/L	18	17	5.0	30%	Pass	
Sodium	P20-No33965	CP	mg/L	530	510	5.0	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).
Q02	The duplicate %RPD is outside the recommended acceptance criteria. Further analysis indicates sample heterogeneity as the cause

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 : **EP2012669**

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	: 15981	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: SPM DEF19009/HEHB GW		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 18-Nov-2020 12:00	Issue Date	: 18-Nov-2020
Client Requested Due Date	: 27-Nov-2020	Scheduled Reporting Date	: **27-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 18.1 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 13 / 13

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 and TOC/DOC 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.

EP2012669-003 : 16-Nov-2020 14:30 : 0082_MW137_6.6_201116

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 - EP005 Total Organic Carbon (TOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012669-001	16-Nov-2020 13:47	0082_MW154S_201116	✓	✓	✓	✓	✓	✓	✓
EP2012669-002	16-Nov-2020 14:01	0082_MW155S_201116	✓	✓	✓	✓	✓	✓	✓
EP2012669-003	16-Nov-2020 14:30	0082_MW137_6.6_201116	✓	✓	✓	✓	✓	✓	✓
EP2012669-004	16-Nov-2020 15:17	0082_MW118D_201116	✓	✓	✓	✓	✓	✓	✓
EP2012669-005	16-Nov-2020 16:27	0082_MW152S_201116	✓	✓	✓	✓	✓	✓	✓
EP2012669-006	16-Nov-2020 16:30	0082_MW122_201116	✓	✓	✓	✓	✓	✓	✓
EP2012669-007	16-Nov-2020 16:48	0082_MW153S_201116	✓	✓	✓	✓		✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012669-001	16-Nov-2020 13:47	0082_MW154S_201116		✓
EP2012669-002	16-Nov-2020 14:01	0082_MW155S_201116		✓
EP2012669-003	16-Nov-2020 14:30	0082_MW137_6.6_201116		✓
EP2012669-004	16-Nov-2020 15:17	0082_MW118D_201116		✓
EP2012669-005	16-Nov-2020 16:27	0082_MW152S_201116		✓
EP2012669-006	16-Nov-2020 16:30	0082_MW122_201116		✓
EP2012669-007	16-Nov-2020 16:48	0082_MW153S_201116	✓	✓
EP2012669-008	16-Nov-2020 17:07	0082_QC301_201116		✓
EP2012669-009	16-Nov-2020 17:08	0082_QC401_201116		✓
EP2012669-010	16-Nov-2020 17:09	0082_QC302_201116		✓
EP2012669-011	16-Nov-2020 17:09	0082_QC402_201116		✓
EP2012669-012	16-Nov-2020 17:10	0082_QC303_201116		✓
EP2012669-013	16-Nov-2020 17:11	0082_QC403_201116		✓

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							
0082_MW118D_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW122_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW137_6.6_20	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW152S_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW153S_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW154S_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW155S_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-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#: 15981 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: MW 18/11/2020 1200	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHB GW

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

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: 18.1 °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	0082_MW154S		16/11/2020 01:47 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
002	0082_MW155S		16/11/2020 02:01 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
003	0082_MW137_6.6		16/11/2020 02:30 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
004	0082_MW118D		16/11/2020 03:17 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
005	0082_MW152S		16/11/2020 04:27 PM	Water	ALS: 4 Non ALS: 0	No	X		X		
006	0082_MW122		16/11/2020 04:30 PM	Water	ALS: 4 Non ALS: 0	No	X		X		
007	0082_MW153S		16/11/2020 04:48 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
008	0082_QC301		16/11/2020 05:07 PM	Water	ALS: 2 Non ALS: 0	No		X			
009	0082_QC401		16/11/2020 05:08 PM	Water	ALS: 2 Non ALS: 0	No		X			

Environmental Division Perth

Work Order Reference EP2012669

Telephone : + 61-8-9406 1301

CHAIN OF CUSTODY

(ALS) COC#: **15981** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHB GW

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 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	0082_QC302		16/11/2020 05:09 PM	Water	ALS: 2 Non ALS: 0	No		X			
011	0082_QC402		16/11/2020 05:09 PM	Water	ALS: 2 Non ALS: 0	No		X			
012	0082_QC303		16/11/2020 05:10 PM	Water	ALS: 2 Non ALS: 0	No		X			
013	0082_QC403		16/11/2020 05:11 PM	Water	ALS: 2 Non ALS: 0	No		X			

CHAIN OF CUSTODY

(ALS) COC#: **15981** *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/HEHB GW

ORDER NO: DEF19009/0082

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: david.james@cardno.com.au, 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	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
001	0082_MW154S	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)
002	0082_MW155S	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)
003	0082_MW137_6.6	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	0082_MW118D	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)
007	0082_MW153S	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#: 15981 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHB GW

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_MW154S	Clear Plastic Bottle - Natural	250 mL	00070719042910	Green	No	
001	0082_MW154S	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023425	Purple	No	
001	0082_MW154S	HDPE (no PTFE)	20 mL	00352005016173	Grey	No	
001	0082_MW154S	HDPE (no PTFE)	20 mL	00352005016097	Grey	No	
002	0082_MW155S	Clear Plastic Bottle - Natural	250 mL	00070719042812	Green	No	
002	0082_MW155S	HDPE (no PTFE)	20 mL	00352005016295	Grey	No	
002	0082_MW155S	HDPE (no PTFE)	20 mL	00352005016144	Grey	No	
002	0082_MW155S	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023114	Purple	No	
003	0082_MW137_6.6	Clear Plastic Bottle - Natural	250 mL	00070719042830	Green	No	
003	0082_MW137_6.6	HDPE (no PTFE)	20 mL	00352005016210	Grey	No	
003	0082_MW137_6.6	HDPE (no PTFE)	20 mL	00352005016323	Grey	No	
003	0082_MW137_6.6	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023435	Purple	No	
004	0082_MW118D	Clear Plastic Bottle - Natural	250 mL	00070719042827	Green	No	
004	0082_MW118D	HDPE (no PTFE)	20 mL	00352005016219	Grey	No	
004	0082_MW118D	HDPE (no PTFE)	20 mL	00352005016327	Grey	No	
004	0082_MW118D	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056559	Purple	No	
005	0082_MW152S	Clear Plastic Bottle - Natural	250 mL	00070719042869	Green	No	
005	0082_MW152S	HDPE (no PTFE)	20 mL	00352005016308	Grey	No	
005	0082_MW152S	HDPE (no PTFE)	20 mL	00352005016278	Grey	No	
005	0082_MW152S	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056053	Purple	No	
006	0082_MW122	Clear Plastic Bottle - Natural	250 mL	00070719042801	Green	No	
006	0082_MW122	HDPE (no PTFE)	20 mL	00352005016047	Grey	No	
006	0082_MW122	HDPE (no PTFE)	20 mL	00352005016039	Grey	No	
006	0082_MW122	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056507	Purple	No	
007	0082_MW153S	Clear Plastic Bottle - Natural	250 mL	00070719042791	Green	No	
007	0082_MW153S	HDPE (no PTFE)	20 mL	00352005016056	Grey	No	

CHAIN OF CUSTODY

COC#: **15981** *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/HEHB GW

ORDER NO: DEF19009/0082

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

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	0082_MW153S	HDPE (no PTFE)	20 mL	00352005016318	Grey	No	
007	0082_MW153S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023416	Purple	No	
008	0082_QC301	HDPE (no PTFE)	20 mL	00352005005171	Grey	No	
008	0082_QC301	HDPE (no PTFE)	20 mL	00352005005260	Grey	No	
009	0082_QC401	HDPE (no PTFE)	20 mL	00352005006543	Grey	No	
009	0082_QC401	HDPE (no PTFE)	20 mL	00352005005140	Grey	No	
010	0082_QC302	HDPE (no PTFE)	20 mL	00352005005261	Grey	No	
010	0082_QC302	HDPE (no PTFE)	20 mL	00352005005350	Grey	No	
011	0082_QC402	HDPE (no PTFE)	20 mL	00352005006324	Grey	No	
011	0082_QC402	HDPE (no PTFE)	20 mL	00352005006388	Grey	No	
012	0082_QC303	HDPE (no PTFE)	20 mL	00352005005338	Grey	No	
012	0082_QC303	HDPE (no PTFE)	20 mL	00352005005148	Grey	No	
013	0082_QC403	HDPE (no PTFE)	20 mL	00352005006396	Grey	No	
013	0082_QC403	HDPE (no PTFE)	20 mL	00352005006536	Grey	No	

Total Bottle Count: ALS: 40, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012669**	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	: 18-Nov-2020 12:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15981	Issue Date	: 26-Nov-2020 23:02
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: SPM DEF19009/HEHB GW		
Quote number	: SY/139/19		
No. of samples received	: 13		
No. of samples analysed	: 13		

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.
- 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_MW154S_20111 6	0082_MW155S_20111 6	0082_MW137_6.6_20 1116	0082_MW118D_20111 6	0082_MW152S_20111 6
				Sampling date / time	16-Nov-2020 13:47	16-Nov-2020 14:01	16-Nov-2020 14:30	16-Nov-2020 15:17	16-Nov-2020 16:27
Compound	CAS Number	LOR	Unit		EP2012669-001	EP2012669-002	EP2012669-003	EP2012669-004	EP2012669-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.72	7.58	7.60	8.24	7.65
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		14800	17100	13800	2620	38100
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		892	1050	1710	442	1680
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		399	481	450	657	182
Total Alkalinity as CaCO3	----	1	mg/L		399	481	450	657	182
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1280	993	760	202	2700
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		7690	8730	7000	982	18100
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		274	338	272	17	521
Magnesium	7439-95-4	1	mg/L		492	564	472	25	1270
Sodium	7440-23-5	1	mg/L		4320	4540	3580	870	10400
Potassium	7440-09-7	1	mg/L		223	198	155	60	580
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		252	276	222	45.0	570
ø Total Cations	----	0.01	meq/L		248	266	212	42.3	598
ø Ionic Balance	----	0.01	%		0.75	1.98	2.34	3.15	2.34
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		<1	<1	31	1	7
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		0.11	<0.02	<0.02	0.83	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		0.12	<0.02	<0.02	0.78	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		0.56	<0.02	<0.02	6.19	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		0.03	<0.02	<0.02	0.66	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW154S_201116	0082_MW155S_201116	0082_MW137_6.6_201116	0082_MW118D_201116	0082_MW152S_201116
				Sampling date / time	16-Nov-2020 13:47	16-Nov-2020 14:01	16-Nov-2020 14:30	16-Nov-2020 15:17	16-Nov-2020 16:27
Compound	CAS Number	LOR	Unit		EP2012669-001	EP2012669-002	EP2012669-003	EP2012669-004	EP2012669-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.73**	<0.01	<0.01	**14.3**	<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	**0.3**	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.09**	<0.02	<0.02	**0.93**	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.14**	<0.02	<0.02	**1.93**	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.06**	<0.02	<0.02	**0.54**	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.05**	<0.01	<0.01	**1.10**	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	**0.09**	<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	0082_MW154S_201116	0082_MW155S_201116	0082_MW137_6.6_201116	0082_MW118D_201116	0082_MW152S_201116
				Sampling date / time	16-Nov-2020 13:47	16-Nov-2020 14:01	16-Nov-2020 14:30	16-Nov-2020 15:17	16-Nov-2020 16:27
					EP2012669-001	EP2012669-002	EP2012669-003	EP2012669-004	EP2012669-005
					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	**15.6**	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	**0.06**	<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		**1.89**	<0.01	<0.01	**43.3**	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**1.29**	<0.01	<0.01	**20.5**	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		**1.74**	<0.01	<0.01	**41.8**	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**86.4**	**83.3**	**79.8**	**91.2**	**82.7**
13C8-PFOA	----	0.02	%		**93.2**	**95.1**	**94.3**	**89.4**	**91.9**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW122_201116	0082_MW153S_201116	----	----	----
				Sampling date / time	16-Nov-2020 16:30	16-Nov-2020 16:48	----	----	----
Compound	CAS Number	LOR	Unit		EP2012669-006	EP2012669-007	--------	--------	--------
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.08	7.56	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5140	33700	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		948	1770	----	----	----
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		700	370	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		700	370	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		596	2280	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		2260	16700	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		31	561	----	----	----
Magnesium	7439-95-4	1	mg/L		58	1180	----	----	----
Sodium	7440-23-5	1	mg/L		1730	9520	----	----	----
Potassium	7440-09-7	1	mg/L		79	528	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		90.1	526	----	----	----
ø Total Cations	----	0.01	meq/L		83.6	553	----	----	----
ø Ionic Balance	----	0.01	%		3.77	2.48	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	3	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		2	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		0.15	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		0.18	<0.02	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW122_201116	0082_MW153S_201116	----	----	----
				Sampling date / time	16-Nov-2020 16:30	16-Nov-2020 16:48	----	----	----
Compound	CAS Number	LOR	Unit		EP2012669-006	EP2012669-007	--------	--------	--------
					Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**1.53**	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.05**	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.25**	<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		**0.33**	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.55**	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.21**	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.16**	<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	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW122_201116	0082_MW153S_201116	----	----	----
				Sampling date / time	16-Nov-2020 16:30	16-Nov-2020 16:48	----	----	----
Compound	CAS Number	LOR	Unit		EP2012669-006	EP2012669-007	--------	--------	--------
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
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		**0.10**	<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		**3.61**	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**1.78**	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**3.38**	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**83.0**	**86.7**	----	----	----
13C8-PFOA	----	0.02	%		**90.7**	**94.2**	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC301_201116	0082_QC401_201116	0082_QC302_201116	0082_QC402_201116	0082_QC303_201116
				Sampling date / time	16-Nov-2020 17:07	16-Nov-2020 17:08	16-Nov-2020 17:09	16-Nov-2020 17:09	16-Nov-2020 17:10
Compound	CAS Number	LOR	Unit		EP2012669-008	EP2012669-009	EP2012669-010	EP2012669-011	EP2012669-012
					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	0082_QC301_201116	0082_QC401_201116	0082_QC302_201116	0082_QC402_201116	0082_QC303_201116
				Sampling date / time	16-Nov-2020 17:07	16-Nov-2020 17:08	16-Nov-2020 17:09	16-Nov-2020 17:09	16-Nov-2020 17:10
					EP2012669-008	EP2012669-009	EP2012669-010	EP2012669-011	EP2012669-012
					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	%		**76.8**	**83.4**	**85.1**	**85.4**	**83.3**
13C8-PFOA	----	0.02	%		**95.5**	**94.2**	**95.0**	**94.2**	**91.1**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC403_201116	----	----	----	----
				Sampling date / time	16-Nov-2020 17:11	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012669-013	--------	--------	--------	--------
					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	0082_QC403_201116	----	----	----	----
				Sampling date / time	16-Nov-2020 17:11	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012669-013	--------	--------	--------	--------
					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	%		**88.4**	----	----	----	----
13C8-PFOA	----	0.02	%		**92.4**	----	----	----	----

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2012669**	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	: 18-Nov-2020
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15981	Issue Date	: 26-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: SPM DEF19009/HEHB GW		
Quote number	: SY/139/19		
No. of samples received	: 13		
No. of samples analysed	: 13		

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: 3381087)									
EP2012669-002	0082_MW155S_201116	EA005-P: pH Value	----	0.01	pH Unit	7.58	7.57	0.132	0% - 20%
EP2012670-005	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.97	7.96	0.126	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3377849)									
EP2012669-001	0082_MW154S_201116	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	14800	14800	0.121	0% - 20%
EP2012670-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	42700	42900	0.491	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3377850)									
EP2012669-001	0082_MW154S_201116	EA025H: Suspended Solids (SS)	----	5	mg/L	892	882	1.07	0% - 20%
EP2012670-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1070	980	8.85	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3381086)									
EP2012669-002	0082_MW155S_201116	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	481	526	8.79	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	481	526	8.79	0% - 20%
EP2012670-005	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	121	120	1.38	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	120	1.38	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373795)									
EP2012669-001	0082_MW154S_201116	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1280	1280	0.00	0% - 20%
EP2012669-007	0082_MW153S_201116	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2280	2240	1.88	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373796)									
EP2012669-001	0082_MW154S_201116	ED045G: Chloride	16887-00-6	1	mg/L	7690	7660	0.359	0% - 20%
EP2012669-007	0082_MW153S_201116	ED045G: Chloride	16887-00-6	1	mg/L	16700	16600	0.258	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3372625)									

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: 3372625) - continued									
EP2012669-001	0082_MW154S_201116	ED093F: Calcium	7440-70-2	1	mg/L	274	265	3.52	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	492	477	3.11	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	4320	4160	3.94	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	223	216	3.12	0% - 20%
EP2012670-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	504	477	5.39	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1650	1530	7.09	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	12700	11700	7.88	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	696	637	8.84	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3373052)									
EP2012669-007	0082_MW153S_201116	EP002: Dissolved Organic Carbon	----	1	mg/L	3	2	0.00	No Limit
EP2012737-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	4	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3373048)									
EP2012669-001	0082_MW154S_201116	EP005: Total Organic Carbon	----	1	mg/L	<1	<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: 3381087)								
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: 3377849)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3377850)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	99.0	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3381086)								
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	98.0	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373795)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	100	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373796)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	94.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3372625)								
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	103	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	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: 3373052)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	104	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3373048)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	102	87.2	116
				<1	100 mg/L	100	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374988)								
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: 3374988) - continued								
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	80.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	90.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	83.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	81.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3374988)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	91.9	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	84.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	80.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	86.4	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	92.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	80.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	78.2	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	95.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	91.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	82.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	97.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3374988)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	84.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	89.2	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	94.9	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	91.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	73.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	93.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	85.6	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3374988)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	90.4	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	86.6	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	81.4	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	87.6	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**

				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: 3373795)							
EP2012669-001	0082_MW154S_201116	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373796)							
EP2012669-001	0082_MW154S_201116	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3373052)							
EP2012670-001	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3373048)							
EP2012669-002	0082_MW155S_201116	EP005: Total Organic Carbon	----	100 mg/L	105	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012669**	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	: 18-Nov-2020
Site	: SPM DEF19009/HEHB GW	Issue Date	: 26-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 13
Order number	: DEF19009/0082	No. of samples analysed	: 13

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	EP2012669--001	0082_MW154S_201116	**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	EP2012669--001	0082_MW154S_201116	**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						
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	----	----	----	24-Nov-2020	16-Nov-2020	**8**

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	13	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	13	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)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	16-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	30-Nov-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	14-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	14-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	23-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)							
0082_MW153S_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	14-Dec-2020	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	14-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116, 0082_QC301_201116, 0082_QC401_201116, 0082_QC302_201116, 0082_QC402_201116, 0082_QC303_201116, 0082_QC403_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	15-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116, 0082_QC301_201116, 0082_QC401_201116, 0082_QC302_201116, 0082_QC402_201116, 0082_QC303_201116, 0082_QC403_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	15-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116, 0082_QC301_201116, 0082_QC401_201116, 0082_QC302_201116, 0082_QC402_201116, 0082_QC303_201116, 0082_QC403_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	15-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_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116, 0082_QC301_201116, 0082_QC401_201116, 0082_QC302_201116, 0082_QC402_201116, 0082_QC303_201116, 0082_QC403_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	15-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW154S_201116, 0082_MW155S_201116, 0082_MW137_6.6_201116, 0082_MW118D_201116, 0082_MW152S_201116, 0082_MW122_201116, 0082_MW153S_201116, 0082_QC301_201116, 0082_QC401_201116, 0082_QC302_201116, 0082_QC402_201116, 0082_QC303_201116, 0082_QC403_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	15-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	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	13	**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	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
Total Organic Carbon	EP005	1	10	**10.00**	**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	19	**10.53**	**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	13	**7.69**	**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	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
Total Organic Carbon	EP005	2	10	**20.00**	**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	19	**5.26**	**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	13	**7.69**	**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	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
Total Organic Carbon	EP005	1	10	**10.00**	**5.00**	✓	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	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	13	**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

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	10	**10.00**	**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.
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 : **EP2012670**

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	: 15982	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: SC - DEF19009/HEHB GW		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 18-Nov-2020 12:00	Issue Date	: 18-Nov-2020
Client Requested Due Date	: 27-Nov-2020	Scheduled Reporting Date	: **27-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 18.1 - 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 and TOC/DOC 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)
EP2012670-001	16-Nov-2020 13:55	0082_OTH101_201116	✓	✓	✓	✓	✓	✓	✓
EP2012670-002	16-Nov-2020 14:18	0082_OTH102_201116	✓	✓	✓	✓	✓	✓	✓
EP2012670-003	16-Nov-2020 14:41	0082_OTH103_201116	✓	✓	✓	✓	✓	✓	✓
EP2012670-004	16-Nov-2020 14:55	0082_OTH104_201116	✓	✓	✓	✓	✓	✓	✓
EP2012670-005	16-Nov-2020 15:08	0082_OTH105_201116	✓	✓	✓	✓	✓	✓	✓
EP2012670-006	16-Nov-2020 15:31	0082_MW132_201116	✓	✓	✓	✓	✓	✓	✓
EP2012670-007	16-Nov-2020 15:44	0082_OTH106_201116	✓	✓	✓	✓	✓	✓	✓
EP2012670-008	16-Nov-2020 17:03	0082_MW128_201116	✓	✓	✓	✓		✓	✓

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)
EP2012670-001	16-Nov-2020 13:55	0082_OTH101_201116		✓
EP2012670-002	16-Nov-2020 14:18	0082_OTH102_201116		✓
EP2012670-003	16-Nov-2020 14:41	0082_OTH103_201116		✓
EP2012670-004	16-Nov-2020 14:55	0082_OTH104_201116		✓
EP2012670-005	16-Nov-2020 15:08	0082_OTH105_201116		✓
EP2012670-006	16-Nov-2020 15:31	0082_MW132_201116		✓
EP2012670-007	16-Nov-2020 15:44	0082_OTH106_201116		✓
EP2012670-008	16-Nov-2020 17:03	0082_MW128_201116	✓	✓

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							

0082_MW128_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	✘	----	----
0082_MW132_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	✘	----	----
0082_OTH101_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	✘	----	----
0082_OTH102_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	✘	----	----
0082_OTH103_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	✘	----	----
0082_OTH104_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	✘	----	----
0082_OTH105_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	✘	----	----
0082_OTH106_2011	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-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#: 15982 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: MU 18/11/2020 1200	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHB GW

ORDER NO: DEF19009/0082

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

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

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: 18.1 °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	0082_OTH101		16/11/2020 01:55 PM	Water	ALS: 4 Non ALS: 0	No	X		
002	0082_OTH102		16/11/2020 02:18 PM	Water	ALS: 4 Non ALS: 0	No	X		
003	0082_OTH103		16/11/2020 02:41 PM	Water	ALS: 4 Non ALS: 0	No	X		
004	0082_OTH104		16/11/2020 02:55 PM	Water	ALS: 4 Non ALS: 0	No	X		
005	0082_OTH105		16/11/2020 03:08 PM	Water	ALS: 4 Non ALS: 0	No	X		
006	0082_MW132		16/11/2020 03:31 PM	Water	ALS: 4 Non ALS: 0	No	X		
007	0082_OTH106		16/11/2020 03:44 PM	Water	ALS: 4 Non ALS: 0	No	X		
008	0082_MW128		16/11/2020 05:03 PM	Water	ALS: 6 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012670

Telephone : + 61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: 15982 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHB GW

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_OTH101	Clear Plastic Bottle - Natural	250 mL	00070719042916	Green	No	
001	0082_OTH101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023735	Purple	No	
001	0082_OTH101	HDPE (no PTFE)	20 mL	00350019106868	Grey	No	
001	0082_OTH101	HDPE (no PTFE)	20 mL	00350019106803	Grey	No	
002	0082_OTH102	Clear Plastic Bottle - Natural	250 mL	00070719042952	Green	No	
002	0082_OTH102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023341	Purple	No	
002	0082_OTH102	HDPE (no PTFE)	20 mL	00350019106641	Grey	No	
002	0082_OTH102	HDPE (no PTFE)	20 mL	00350019106831	Grey	No	
003	0082_OTH103	Clear Plastic Bottle - Natural	250 mL	00070719042013	Green	No	
003	0082_OTH103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023710	Purple	No	
003	0082_OTH103	HDPE (no PTFE)	20 mL	00350019106805	Grey	No	
003	0082_OTH103	HDPE (no PTFE)	20 mL	00350019106864	Grey	No	
004	0082_OTH104	Clear Plastic Bottle - Natural	250 mL	00070719042133	Green	No	
004	0082_OTH104	HDPE (no PTFE)	20 mL	00350019106716	Grey	No	
004	0082_OTH104	HDPE (no PTFE)	20 mL	00350019106899	Grey	No	
004	0082_OTH104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023714	Purple	No	
005	0082_OTH105	Clear Plastic Bottle - Natural	250 mL	00070719042284	Green	No	
005	0082_OTH105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023721	Purple	No	
005	0082_OTH105	HDPE (no PTFE)	20 mL	00350019106749	Grey	No	
005	0082_OTH105	HDPE (no PTFE)	20 mL	00350019106841	Grey	No	
006	0082_MW132	Clear Plastic Bottle - Natural	250 mL	00070719042921	Green	No	
006	0082_MW132	HDPE (no PTFE)	20 mL	00350019106806	Grey	No	
006	0082_MW132	HDPE (no PTFE)	20 mL	00350019106847	Grey	No	
006	0082_MW132	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023739	Purple	No	
007	0082_OTH106	Clear Plastic Bottle - Natural	250 mL	00070719042260	Green	No	
007	0082_OTH106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023423	Purple	No	

CHAIN OF CUSTODY

ALS COC#: **15982** *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

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

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	0082_OTH106	HDPE (no PTFE)	20 mL	00350019106835	Grey	No	
007	0082_OTH106	HDPE (no PTFE)	20 mL	00350019106761	Grey	No	
008	0082_MW128	Clear Plastic Bottle - Natural	250 mL	00070719042900	Green	No	
008	0082_MW128	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023693	Purple	No	
008	0082_MW128	HDPE (no PTFE)	20 mL	00352005006998	Grey	No	
008	0082_MW128	HDPE (no PTFE)	20 mL	00350019106851	Grey	No	
008	0082_MW128	HDPE (no PTFE)	20 mL	00350019106852	Grey	No	
008	0082_MW128	HDPE (no PTFE)	20 mL	00352005007347	Grey	No	

Total Bottle Count: ALS: 34, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012670**	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	: 18-Nov-2020 12:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15982	Issue Date	: 27-Nov-2020 18:21
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: SC - DEF19009/HEHB GW		
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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	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.
- 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: PFAS results for sample #6 confirmed by re-extraction and re-analysis.
- EA025H (Suspended Solids): Analysis confirmed by re-preparation and re-analysis for sample #1 and #2.
- EP231X: Particular samples required dilution prior to extraction due to matrix interferences. LOR values have been adjusted 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	0082_OTH101_201116	0082_OTH102_201116	0082_OTH103_201116	0082_OTH104_201116	0082_OTH105_201116
				Sampling date / time	16-Nov-2020 13:55	16-Nov-2020 14:18	16-Nov-2020 14:41	16-Nov-2020 14:55	16-Nov-2020 15:08
Compound	CAS Number	LOR	Unit		EP2012670-001	EP2012670-002	EP2012670-003	EP2012670-004	EP2012670-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.88	8.03	8.05	7.92	7.97
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		44000	42700	43800	43700	43700
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		442	972	1070	1070	437
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		116	124	122	127	121
Total Alkalinity as CaCO3	----	1	mg/L		116	124	122	127	121
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		3070	2960	2960	3110	3100
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		20500	20400	20400	20500	20400
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		475	483	483	504	498
Magnesium	7439-95-4	1	mg/L		1540	1580	1570	1650	1610
Sodium	7440-23-5	1	mg/L		11900	12000	12000	12700	12300
Potassium	7440-09-7	1	mg/L		646	661	657	696	679
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		644	640	640	646	642
ø Total Cations	----	0.01	meq/L		684	693	692	731	710
ø Ionic Balance	----	0.01	%		3.02	4.01	3.95	6.22	4.98
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		1	2	1	<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)				Sample ID	0082_OTH101_201116	0082_OTH102_201116	0082_OTH103_201116	0082_OTH104_201116	0082_OTH105_201116
				Sampling date / time	16-Nov-2020 13:55	16-Nov-2020 14:18	16-Nov-2020 14:41	16-Nov-2020 14:55	16-Nov-2020 15:08
Compound	CAS Number	LOR	Unit		EP2012670-001	EP2012670-002	EP2012670-003	EP2012670-004	EP2012670-005
					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	0082_OTH101_201116	0082_OTH102_201116	0082_OTH103_201116	0082_OTH104_201116	0082_OTH105_201116
				Sampling date / time	16-Nov-2020 13:55	16-Nov-2020 14:18	16-Nov-2020 14:41	16-Nov-2020 14:55	16-Nov-2020 15:08
					EP2012670-001	EP2012670-002	EP2012670-003	EP2012670-004	EP2012670-005
					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	%		**89.8**	**92.1**	**89.8**	**90.6**	**88.6**
13C8-PFOA	----	0.02	%		**87.3**	**89.1**	**86.8**	**89.8**	**87.3**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW132_201116	0082_OTH106_201116	0082_MW128_201116	----	----
				Sampling date / time	16-Nov-2020 15:31	16-Nov-2020 15:44	16-Nov-2020 17:03	----	----
Compound	CAS Number	LOR	Unit		EP2012670-006	EP2012670-007	EP2012670-008	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.79	7.94	7.71	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		35200	43700	42700	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		360	426	67200	----	----
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		202	120	185	----	----
Total Alkalinity as CaCO3	----	1	mg/L		202	120	185	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2560	3060	3030	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		17000	20600	19800	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		462	485	540	----	----
Magnesium	7439-95-4	1	mg/L		1310	1590	1550	----	----
Sodium	7440-23-5	1	mg/L		9990	12100	12200	----	----
Potassium	7440-09-7	1	mg/L		552	660	666	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		537	647	625	----	----
ø Total Cations	----	0.01	meq/L		580	698	702	----	----
ø Ionic Balance	----	0.01	%		3.82	3.79	5.79	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		2	1	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	----	14.13	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.05	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW132_201116	0082_OTH106_201116	0082_MW128_201116	----	----
				Sampling date / time	16-Nov-2020 15:31	16-Nov-2020 15:44	16-Nov-2020 17:03	----	----
Compound	CAS Number	LOR	Unit		EP2012670-006	EP2012670-007	EP2012670-008	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.04**	<0.02	<0.05	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	<0.05	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.05	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.2	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.05	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.05	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.12	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.05	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.12	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.12	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.12	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.12	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW132_201116	0082_OTH106_201116	0082_MW128_201116	----	----
				Sampling date / time	16-Nov-2020 15:31	16-Nov-2020 15:44	16-Nov-2020 17:03	----	----
Compound	CAS Number	LOR	Unit		EP2012670-006	EP2012670-007	EP2012670-008	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.05	----	----
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		**0.04**	<0.01	<0.05	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.04**	<0.01	<0.05	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.04**	<0.01	<0.05	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**88.5**	**89.2**	**87.2**	----	----
13C8-PFOA	----	0.02	%		**84.7**	**87.9**	**86.0**	----	----

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	: **EP2012670**	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	: 18-Nov-2020
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15982	Issue Date	: 27-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: SC - DEF19009/HEHB GW		
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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	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: **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: 3381087)									
EP2012669-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.58	7.57	0.132	0% - 20%
EP2012670-005	0082_OTH105_201116	EA005-P: pH Value	----	0.01	pH Unit	7.97	7.96	0.126	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3377849)									
EP2012669-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	14800	14800	0.121	0% - 20%
EP2012670-002	0082_OTH102_201116	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	42700	42900	0.491	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3377850)									
EP2012669-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	892	882	1.07	0% - 20%
EP2012670-004	0082_OTH104_201116	EA025H: Suspended Solids (SS)	----	5	mg/L	1070	980	8.85	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3381086)									
EP2012669-002	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	481	526	8.79	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	481	526	8.79	0% - 20%
EP2012670-005	0082_OTH105_201116	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	121	120	1.38	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	120	1.38	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373795)									
EP2012669-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1280	1280	0.00	0% - 20%
EP2012669-007	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2280	2240	1.88	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373796)									
EP2012669-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	7690	7660	0.359	0% - 20%
EP2012669-007	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	16700	16600	0.258	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3372625)									

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 (%)
ED093F: Dissolved Major Cations (QC Lot: 3372625) - continued									
EP2012669-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	274	265	3.52	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	492	477	3.11	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	4320	4160	3.94	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	223	216	3.12	0% - 20%
EP2012670-004	0082_OTH104_201116	ED093F: Calcium	7440-70-2	1	mg/L	504	477	5.39	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1650	1530	7.09	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	12700	11700	7.88	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	696	637	8.84	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3373052)									
EP2012669-007	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	2	0.00	No Limit
EP2012737-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	4	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3373048)									
EP2012669-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3377798) - continued									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3381087)								
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: 3377849)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3377850)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	99.0	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3381086)								
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	98.0	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373795)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	100	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373796)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	94.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3372625)								
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	103	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	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: 3373052)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	104	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3373048)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	102	87.2	116
				<1	100 mg/L	100	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3377798)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.2	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: 3377798) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	96.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	98.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	93.8	69.0	134
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	97.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3377798)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	81.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	80.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	92.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	80.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	81.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	98.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	98.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	83.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	99.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	98.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	84.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3377798)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	105	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	83.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	83.8	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	80.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	84.1	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	109	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	92.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3377798)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	104	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	90.0	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	88.2	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	89.2	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: 3373795)							
EP2012669-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373796)							
EP2012669-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3373052)							
EP2012670-001	0082_OTH101_201116	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3373048)							
EP2012669-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	105	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	82.2	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	85.8	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.0	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	98.8	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	83.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	87.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	85.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	78.4	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	93.8	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	79.6	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	81.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.0	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	80.4	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	104	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	90.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	81.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3377798)							
ES2041195-019	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	83.0	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	83.3	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	80.2	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	83.3	57.6	145

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: 3377798) - continued							
ES2041195-019	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	98.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	94.2	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	101	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	93.2	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	91.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	109	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012670**	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	: 18-Nov-2020
Site	: SC - DEF19009/HEHB GW	Issue Date	: 27-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 8
Order number	: DEF19009/0082	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	EP2012669--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	EP2012669--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							
0082_OTH101_201116,	0082_OTH102_201116,	----	----	----	24-Nov-2020	16-Nov-2020	**8**
0082_OTH103_201116,	0082_OTH104_201116,						
0082_OTH105_201116,	0082_MW132_201116,						
0082_OTH106_201116,	0082_MW128_201116						

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	17	5.88	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: 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)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	16-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	30-Nov-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	14-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	14-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	23-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)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	14-Dec-2020	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
0082_MW128_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	14-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_OTH101_201116, 0082_OTH102_201116, 0082_OTH103_201116, 0082_OTH104_201116, 0082_OTH105_201116, 0082_MW132_201116, 0082_OTH106_201116, 0082_MW128_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-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	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	1	17	**5.88**	**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	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
Total Organic Carbon	EP005	1	10	**10.00**	**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	19	**10.53**	**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	17	**5.88**	**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	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
Total Organic Carbon	EP005	2	10	**20.00**	**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	19	**5.26**	**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	17	**5.88**	**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	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
Total Organic Carbon	EP005	1	10	**10.00**	**5.00**	✓	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	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	17	**5.88**	**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

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	10	**10.00**	**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.
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 : **EP2012671**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 15987	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: SPD DEF19009/HEHB SED		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 18-Nov-2020 12:00	Issue Date	: 18-Nov-2020
Client Requested Due Date	: 27-Nov-2020	Scheduled Reporting Date	: **27-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 18.1 - Ice present
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: **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)
EP2012671-001	16-Nov-2020 14:52	0082_SS167_201116	✓	✓	✓	✓
EP2012671-002	16-Nov-2020 14:58	0082_SS169_201116	✓	✓	✓	✓
EP2012671-003	16-Nov-2020 15:25	0082_SD164_201116	✓	✓	✓	✓
EP2012671-004	16-Nov-2020 15:36	0082_SS165_201116	✓	✓	✓	✓

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

(ALS) COC#: **15987** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 18/11/2020 1200	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHB SED

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

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: 18.1 °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_SS167		16/11/2020 02:52 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0082_SS169		16/11/2020 02:58 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0082_SD164		16/11/2020 03:25 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0082_SS165		16/11/2020 03:36 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012671

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: **15987** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SPM DEF19009/HEHB SED

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_SS167	Soil Glass Jar - Unpreserved	150 mL	00260220050310	Orange	No	
001	0082_SS167	HDPE Soil Jar	200 mL	00620719042383	Grey	No	
002	0082_SS169	Soil Glass Jar - Unpreserved	150 mL	00260220069329	Orange	No	
002	0082_SS169	HDPE Soil Jar	200 mL	00620719067713	Grey	No	
003	0082_SD164	HDPE Soil Jar	200 mL	00620719067728	Grey	No	
003	0082_SD164	Soil Glass Jar - Unpreserved	150 mL	00260220050231	Orange	No	
004	0082_SS165	Soil Glass Jar - Unpreserved	150 mL	00260220050391	Orange	No	
004	0082_SS165	HDPE Soil Jar	200 mL	00620719042392	Grey	No	

Total Bottle Count: ALS: 8, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012671**	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	: 18-Nov-2020 12:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15987	Issue Date	: 26-Nov-2020 13:07
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: SPD DEF19009/HEHB SED		
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*
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	0082_SS167_201116	0082_SS169_201116	0082_SD164_201116	0082_SS165_201116	----
			Sampling date / time	16-Nov-2020 14:52	16-Nov-2020 14:58	16-Nov-2020 15:25	16-Nov-2020 15:36	----
Compound	CAS Number	LOR	Unit	EP2012671-001	EP2012671-002	EP2012671-003	EP2012671-004	--------
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.7	9.0	9.2	7.3	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	61	97	81	195	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	19.4	18.6	17.3	28.4	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	5.4	6.6	8.5	10.1	----
Exchangeable Magnesium	----	0.1	meq/100g	0.4	0.7	0.6	1.6	----
Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.5	0.7	----
Exchangeable Sodium	----	0.1	meq/100g	0.2	0.3	0.3	0.2	----
Cation Exchange Capacity	----	0.1	meq/100g	6.2	8.0	9.9	12.6	----
Exchangeable Sodium Percent	----	0.1	%	2.5	4.3	2.7	1.6	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	0.8	1.5	0.7	5.0	----
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	0.0008	----
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	0.0024	0.0016	0.0345	0.0083	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0011	<0.0002	<0.0002	0.0015	----
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	0.0007	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0008	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0003	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0004	0.0005	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0004	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SS167_201116	0082_SS169_201116	0082_SD164_201116	0082_SS165_201116	----
				Sampling date / time	16-Nov-2020 14:52	16-Nov-2020 14:58	16-Nov-2020 15:25	16-Nov-2020 15:36	----
Compound	CAS Number	LOR	Unit		EP2012671-001	EP2012671-002	EP2012671-003	EP2012671-004	--------
					Result	Result	Result	Result	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
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	**0.0005**	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	**0.0004**	----
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	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<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	**0.0026**	**0.0007**	----
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		**0.0035**	**0.0016**	**0.0399**	**0.0133**	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0082_SS167_201116	0082_SS169_201116	0082_SD164_201116	0082_SS165_201116	----
			Sampling date / time	16-Nov-2020 14:52	16-Nov-2020 14:58	16-Nov-2020 15:25	16-Nov-2020 15:36	----
Compound	CAS Number	LOR	Unit	EP2012671-001	EP2012671-002	EP2012671-003	EP2012671-004	--------
				Result	Result	Result	Result	----
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**0.0024**	**0.0016**	**0.0347**	**0.0091**	**----**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**0.0024**	**0.0016**	**0.0395**	**0.0103**	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**118**	**104**	**112**	**95.5**	**----**
13C8-PFOA	----	0.0002	%	**96.5**	**99.0**	**102**	**103**	**----**

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	: **EP2012671**	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	: 18-Nov-2020
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15987	Issue Date	: 26-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: SPD DEF19009/HEHB SED		
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 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: 3372057)									
EP2012671-001	0082_SS167_201116	EA002: pH Value	----	0.1	pH Unit	8.7	8.8	0.00	0% - 20%
EP2012674-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.9	8.7	2.27	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3372056)									
EP2012671-001	0082_SS167_201116	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	61	62	0.00	0% - 20%
EP2012674-002	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	14	17	19.3	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3372083)									
EP2012671-001	0082_SS167_201116	EA055: Moisture Content	----	0.1	%	19.4	19.0	1.98	0% - 20%
EP2012674-002	Anonymous	EA055: Moisture Content	----	0.1	%	20.6	20.8	1.14	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3379380)									
EP2012671-001	0082_SS167_201116	ED007: Exchangeable Sodium Percent	----	0.1	%	2.5	2.4	0.00	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	5.4	4.8	12.2	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.2	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	6.2	5.6	11.0	0% - 20%
EP2012674-002	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	64.3	65.7	2.20	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	9.9	8.8	11.7	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	20.6	21.5	4.10	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	2.7	2.8	4.53	0% - 20%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	59.7	63.4	5.98	0% - 20%
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	92.9	96.4	3.78	0% - 20%
EP004: Organic Matter (QC Lot: 3372048)									
EP2012671-001	0082_SS167_201116	EP004: Organic Matter	----	0.5	%	0.8	0.9	0.00	No Limit
EP2012674-003	Anonymous	EP004: Organic Matter	----	0.5	%	5.7	5.7	0.00	0% - 50%

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: 3374581)									
EP2012671-001	0082_SS167_201116	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	0.0024	0.0028	16.4	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0011	0.0011	0.00	No Limit
EP2012673-002	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: 3374581)									
EP2012671-001	0082_SS167_201116	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
EP2012673-002	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: 3374581)									
EP2012671-001	0082_SS167_201116	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: 3374581) - continued									
EP2012671-001	0082_SS167_201116	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
EP2012673-002	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: 3374581)									
EP2012671-001	0082_SS167_201116	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
EP2012673-002	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: 3372057)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3372056)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3379380)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	98.8	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	101	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	114	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	113	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	99.8	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
EP004: Organic Matter (QCLot: 3372048)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	94.8	70.0	120
				<0.5	85 %	85.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374581)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3374581)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	98.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.2	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.2	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	73.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3374581)								

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: 3374581) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	94.6	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	78.5	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	71.8	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.0	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3374581)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	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	78.8	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	93.2	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	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374581)							
EP2012671-001	0082_SS167_201116	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	83.2	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	85.2	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	85.2	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	86.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	107	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	108	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3374581)							
EP2012671-001	0082_SS167_201116	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	100	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	104	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	95.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	104	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	105	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	94.4	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	98.0	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: 3374581) - continued							
EP2012671-001	0082_SS167_201116	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	97.6	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	98.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	121	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	72.0	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3374581)							
EP2012671-001	0082_SS167_201116	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	86.0	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	103	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	83.2	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	77.6	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	100	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	79.6	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	80.0	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3374581)							
EP2012671-001	0082_SS167_201116	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	92.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	87.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	106	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	120	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012671**	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	: 18-Nov-2020
Site	: SPD DEF19009/HEHB SED	Issue Date	: 26-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 4
Order number	: DEF19009/0082	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)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**19-Nov-2020**	23-Nov-2020	✓	**19-Nov-2020**	19-Nov-2020	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**19-Nov-2020**	23-Nov-2020	✓	**19-Nov-2020**	17-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	30-Nov-2020	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**24-Nov-2020**	14-Dec-2020	✓	**24-Nov-2020**	14-Dec-2020	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**25-Nov-2020**	14-Dec-2020	✓	**25-Nov-2020**	14-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-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
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0082_SS167_201116, 0082_SS169_201116, 0082_SD164_201116, 0082_SS165_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓

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	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	12	**16.67**	**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	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	12	**16.67**	**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	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	12	**8.33**	**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).
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 : **EP2012672**

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	: 15988	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB SW - ab		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 18-Nov-2020 12:00	Issue Date	: 18-Nov-2020
Client Requested Due Date	: 27-Nov-2020	Scheduled Reporting Date	: **27-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 18.1 - 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 and DOC 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)
EP2012672-001	16-Nov-2020 16:00	0082_SW181_201116	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012672-001	16-Nov-2020 16:00	0082_SW181_201116	✓

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_SW181_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
CLAIRE ARMSTRONG		
- 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#: **15988** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 18/11/2020 1200	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB SW - ab

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

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: 18.1 °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	0082_SW181		16/11/2020 04:00 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division Perth

Work Order Reference

EP2012672

Telephone : + 61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: **15988** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB SW - ab

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_SW181	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056400	Purple	No	
001	0082_SW181	Clear Plastic Bottle - Natural	250 mL	00070719042809	Green	No	
001	0082_SW181	HDPE (no PTFE)	20 mL	00352005016130	Grey	No	
001	0082_SW181	HDPE (no PTFE)	20 mL	00352005016148	Grey	No	

Total Bottle Count: ALS: 4, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012672**	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	: 18-Nov-2020 12:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15988	Issue Date	: 26-Nov-2020 23:09
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB SW - ab		
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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	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.
- 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	0082_SW181_201116	----	----	----	----
				Sampling date / time	16-Nov-2020 16:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012672-001	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.49	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		140000	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		66	----	----	----	----
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		36	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		111	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		147	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		8500	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		64600	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		1580	----	----	----	----
Magnesium	7439-95-4	1	mg/L		5450	----	----	----	----
Sodium	7440-23-5	1	mg/L		41900	----	----	----	----
Potassium	7440-09-7	1	mg/L		2020	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		2000	----	----	----	----
ø Total Cations	----	0.01	meq/L		2400	----	----	----	----
ø Ionic Balance	----	0.01	%		9.07	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		16	----	----	----	----
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	0082_SW181_201116	----	----	----	----
			Sampling date / time		16-Nov-2020 16:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012672-001	--------	--------	--------	--------
					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	0082_SW181_201116	----	----	----	----
				Sampling date / time	16-Nov-2020 16:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012672-001	--------	--------	--------	--------
					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		<0.05	----	----	----	----
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	%		**94.5**	----	----	----	----
13C8-PFOA	----	0.02	%		**89.0**	----	----	----	----

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	: **EP2012672**	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	: 18-Nov-2020
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15988	Issue Date	: 26-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB SW - ab		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		

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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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Chris Lemaitre	Laboratory Manager (Perth)	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: **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: 3381087)									
EP2012669-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.58	7.57	0.132	0% - 20%
EP2012670-005	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.97	7.96	0.126	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3377849)									
EP2012669-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	14800	14800	0.121	0% - 20%
EP2012670-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	42700	42900	0.491	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3377850)									
EP2012669-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	892	882	1.07	0% - 20%
EP2012670-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1070	980	8.85	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3381086)									
EP2012669-002	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	481	526	8.79	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	481	526	8.79	0% - 20%
EP2012670-005	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	121	120	1.38	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	120	1.38	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373795)									
EP2012669-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1280	1280	0.00	0% - 20%
EP2012669-007	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2280	2240	1.88	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373796)									
EP2012669-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	7690	7660	0.359	0% - 20%
EP2012669-007	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	16700	16600	0.258	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3372627)									

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: 3372627) - continued									
EP2012672-001	0082_SW181_201116	ED093F: Calcium	7440-70-2	1	mg/L	1580	1650	3.99	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	5450	5650	3.54	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	41900	43600	4.03	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2020	2080	3.15	0% - 20%
EP2012792-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	28	28	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	31	31	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	58	58	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	22	22	0.00	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3373052)									
EP2012669-007	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	2	0.00	No Limit
EP2012737-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	4	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3377798) - continued									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3381087)								
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: 3377849)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3377850)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	99.0	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3381086)								
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	98.0	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373795)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	100	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373796)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	94.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3372627)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	103	85.9	113
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	98.4	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.4	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3373052)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	104	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3377798)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	96.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	98.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	93.8	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3377798) - 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	97.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3377798)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	81.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	80.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	92.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	80.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	81.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	98.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	98.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	83.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	99.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	98.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	84.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3377798)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	105	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	83.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	83.8	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	80.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	84.1	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	109	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	92.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3377798)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	104	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	90.0	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	88.2	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	89.2	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: 3373795)							
EP2012669-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373796)							
EP2012669-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3373052)							
EP2012670-001	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	82.2	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	85.8	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.0	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	98.8	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	83.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	87.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	85.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	78.4	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	93.8	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	79.6	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	81.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.0	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	80.4	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	104	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	90.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	81.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3377798)							
ES2041195-019	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	83.0	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	83.3	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	80.2	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	83.3	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	98.2	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: 3377798) - continued							
ES2041195-019	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	94.2	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	101	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	93.2	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	91.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	109	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012672**	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	: 18-Nov-2020
Site	: DEF19009/HEHB SW - ab	Issue Date	: 26-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 1
Order number	: DEF19009/0082	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

- **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	EP2012669--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	EP2012669--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						
0082_SW181_201116	----	----	----	24-Nov-2020	16-Nov-2020	**8**

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	17	5.88	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_SW181_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	16-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_SW181_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-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
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_SW181_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_SW181_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	30-Nov-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_SW181_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	14-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_SW181_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	14-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_SW181_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	23-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_SW181_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	14-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW181_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW181_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_SW181_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW181_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_SW181_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-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	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	1	17	**5.88**	**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	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	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	17	**5.88**	**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	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	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	17	**5.88**	**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	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	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	17	**5.88**	**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 : **EP2012673**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 15989	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB SED - ab		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 18-Nov-2020 12:00	Issue Date	: 18-Nov-2020
Client Requested Due Date	: 27-Nov-2020	Scheduled Reporting Date	: **27-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 18.1 - Ice present
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: **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)
EP2012673-001	16-Nov-2020 16:02	0082_SD181_201116	✓	✓	✓	✓
EP2012673-002	16-Nov-2020 16:39	0082_SS179_201116	✓	✓	✓	✓
EP2012673-003	16-Nov-2020 16:41	0082_SS173_201116	✓	✓	✓	✓
EP2012673-004	16-Nov-2020 16:56	0082_SS171_201116	✓	✓	✓	✓

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
EP2012673

Telephone : + 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEF19009 **Client:** CARBNO **Project Manager:** M. Boudali

Phone: ( )

ALS Compass COC Reference: **# Samples:** **Sampler:** S. McCulloch

Phone: 0412583240

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? 13.1 °C

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
Date / Time: 17/11/20.	Date / Time: 18/11/2020 1200	Date / Time:	Date / Time:

CHAIN OF CUSTODY

(ALS) COC#: **15989** *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 18/11/2020 1200	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB SED - ab

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

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: 12.1 °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_SD181		16/11/2020 04:02 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0082_SS179		16/11/2020 04:39 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0082_SS173		16/11/2020 04:41 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0082_SS171		16/11/2020 04:56 PM	Soil	ALS: 2 Non ALS: 0	No	X		

CHAIN OF CUSTODY

COC#: **15989** *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/HEHB SED - ab

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

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_SD181	Soil Glass Jar - Unpreserved	150 mL	00260520053169	Orange	No	
001	0082_SD181	HDPE Soil Jar	200 mL	00621019038114	Grey	No	
002	0082_SS179	HDPE Soil Jar	200 mL	00621019018393	Grey	No	
002	0082_SS179	Soil Glass Jar - Unpreserved	150 mL	00260520053142	Orange	No	
003	0082_SS173	HDPE Soil Jar	200 mL	00621019038018	Grey	No	
003	0082_SS173	Soil Glass Jar - Unpreserved	150 mL	00260520072466	Orange	No	
004	0082_SS171	Soil Glass Jar - Unpreserved	150 mL	00260520053046	Orange	No	
004	0082_SS171	HDPE Soil Jar	200 mL	00621019038055	Grey	No	

Total Bottle Count: ALS: 8, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012673**	Page	: 1 of 6
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	: 18-Nov-2020 12:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15989	Issue Date	: 02-Dec-2020 16:31
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB SED - ab		
Quote number	: SY/139/19		
No. of samples received	: 4		
No. of samples analysed	: 4		

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
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

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.
- Amendment (01/12/2020): This report has been amended following changes to the analytical data reported. The quality system is being utilised to resolve this issue. The specific data affected includes 0082_SD181_201116 (sample #1) ED008 Exchangeable Cations and EA010 Conductivity.
- 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**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_SD181_201116	0082_SS179_201116	0082_SS173_201116	0082_SS171_201116	----
				Sampling date / time	16-Nov-2020 16:02	16-Nov-2020 16:39	16-Nov-2020 16:41	16-Nov-2020 16:56	----
					EP2012673-001	EP2012673-002	EP2012673-003	EP2012673-004	--------
					Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**8.7**	**8.6**	**9.0**	**9.1**	**----**
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**18200**	**3**	**108**	**119**	**----**
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**18.6**	**0.3**	**26.5**	**0.3**	**----**
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		**----**	**6.0**	**14.0**	**9.8**	**----**
Exchangeable Magnesium	----	0.1	meq/100g		**----**	**1.7**	**3.2**	**0.7**	**----**
Exchangeable Potassium	----	0.1	meq/100g		**----**	**0.1**	**0.5**	**0.2**	**----**
Exchangeable Sodium	----	0.1	meq/100g		**----**	**2.8**	**0.6**	**0.4**	**----**
Cation Exchange Capacity	----	0.1	meq/100g		**----**	**10.7**	**18.3**	**11.0**	**----**
Exchangeable Sodium Percent	----	0.1	%		**----**	**26.6**	**3.4**	**3.2**	**----**
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		**6.4**	**----**	**----**	**----**	**----**
Exchangeable Magnesium	----	0.1	meq/100g		**0.5**	**----**	**----**	**----**	**----**
Exchangeable Potassium	----	0.1	meq/100g		<0.1	**----**	**----**	**----**	**----**
Exchangeable Sodium	----	0.1	meq/100g		<0.1	**----**	**----**	**----**	**----**
Cation Exchange Capacity	----	0.1	meq/100g		**7.1**	**----**	**----**	**----**	**----**
Exchangeable Sodium Percent	----	0.1	%		**0.6**	**----**	**----**	**----**	**----**
EP004: Organic Matter									
Organic Matter	----	0.5	%		**1.8**	**1.8**	**1.9**	**0.8**	**----**
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		<0.0002	<0.0002	**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	0082_SD181_201116	0082_SS179_201116	0082_SS173_201116	0082_SS171_201116	----
				Sampling date / time	16-Nov-2020 16:02	16-Nov-2020 16:39	16-Nov-2020 16:41	16-Nov-2020 16:56	----
Compound	CAS Number	LOR	Unit		EP2012673-001	EP2012673-002	EP2012673-003	EP2012673-004	--------
					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	0082_SD181_201116	0082_SS179_201116	0082_SS173_201116	0082_SS171_201116	----
				Sampling date / time	16-Nov-2020 16:02	16-Nov-2020 16:39	16-Nov-2020 16:41	16-Nov-2020 16:56	----
Compound	CAS Number	LOR	Unit		EP2012673-001	EP2012673-002	EP2012673-003	EP2012673-004	--------
					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		<0.0005	<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	<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		<0.0002	<0.0002	**0.0002**	<0.0002	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	**0.0002**	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	**0.0002**	<0.0002	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**98.5**	**115**	**120**	**114**	----
13C8-PFOA	----	0.0002	%		**111**	**99.0**	**102**	**108**	----

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	: **EP2012673**	Page	: 1 of 8
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	: 18-Nov-2020
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15989	Issue Date	: 02-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB SED - ab		
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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
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

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: 3372057)									
EP2012671-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.8	0.00	0% - 20%
EP2012674-002	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.9	8.7	2.27	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3372056)									
EP2012671-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	61	62	0.00	0% - 20%
EP2012674-002	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	18100	18100	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3372083)									
EP2012671-001	Anonymous	EA055: Moisture Content	----	0.1	%	19.4	19.0	1.98	0% - 20%
EP2012674-002	Anonymous	EA055: Moisture Content	----	0.1	%	20.6	20.8	1.14	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3379380)									
EP2012671-001	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	2.5	2.4	0.00	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	5.4	4.8	12.2	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.2	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	6.2	5.6	11.0	0% - 20%
EP2012674-002	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	64.3	65.7	2.20	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	9.9	8.8	11.7	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	20.6	21.5	4.10	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	2.7	2.8	4.53	0% - 20%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	59.7	63.4	5.98	0% - 20%
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	92.9	96.4	3.78	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3379379)									
EP2012674-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	2.9	2.9	0.00	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	18.6	18.9	1.70	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED008: Exchangeable Cations (QC Lot: 3379379) - continued									
EP2012674-002	Anonymous	ED008: Exchangeable Magnesium	----	0.1	meq/100g	7.6	7.7	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	27.4	27.8	1.37	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3396610)									
EP2012944-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.3	1.2	0.00	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	16.2	16.4	1.09	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.3	3.4	3.26	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	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	20.0	20.3	1.42	0% - 20%
EP004: Organic Matter (QC Lot: 3372048)									
EP2012671-001	Anonymous	EP004: Organic Matter	----	0.5	%	0.8	0.9	0.00	No Limit
EP2012674-003	Anonymous	EP004: Organic Matter	----	0.5	%	5.7	5.7	0.00	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3374581)									
EP2012671-001	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	0.0024	0.0028	16.4	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0011	0.0011	0.00	No Limit
EP2012673-002	0082_SS179_201116	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: 3374581)									
EP2012671-001	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

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3374581) - continued									
EP2012673-002	0082_SS179_201116	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: 3374581)									
EP2012671-001	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
		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
EP2012673-002	0082_SS179_201116	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: 3374581)									
EP2012671-001	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

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 (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3374581) - continued									
EP2012671-001	Anonymous	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
EP2012673-002	0082_SS179_201116	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: 3372057)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3372056)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3379380)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	98.8	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	101	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	114	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	113	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	99.8	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3379379)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	89.9	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	98.7	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	114	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	95.4	79.9	110
ED008: Exchangeable Cations (QCLot: 3396610)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	81.5	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	82.8	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	93.0	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	94.2	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	82.2	79.9	110
EP004: Organic Matter (QCLot: 3372048)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	94.8	70.0	120
				<0.5	85 %	85.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374581)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	68.0	136

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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374581) - continued								
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3374581)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	98.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.2	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.2	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	73.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3374581)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	94.6	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	78.5	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	71.8	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.0	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3374581)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	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	78.8	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	93.2	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	Recovery Limits (%): Low	Recovery Limits (%): High

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	83.2	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	85.2	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	85.2	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	86.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	107	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	108	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	100	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	104	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	95.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	104	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	105	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	94.4	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	98.0	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	97.6	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	98.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	121	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	72.0	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	86.0	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	103	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	83.2	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	77.6	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	100	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	79.6	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	80.0	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	92.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	87.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	106	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	120	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012673**	Page	: 1 of 5
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	: 18-Nov-2020
Site	: DEF19009/HEHB SED - ab	Issue Date	: 02-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 4
Order number	: DEF19009/0082	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)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**19-Nov-2020**	23-Nov-2020	✓	**19-Nov-2020**	19-Nov-2020	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**19-Nov-2020**	23-Nov-2020	✓	**19-Nov-2020**	17-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	30-Nov-2020	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**24-Nov-2020**	14-Dec-2020	✓	**24-Nov-2020**	14-Dec-2020	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
0082_SD181_201116	**16-Nov-2020**	**24-Nov-2020**	14-Dec-2020	✓	**24-Nov-2020**	14-Dec-2020	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**25-Nov-2020**	14-Dec-2020	✓	**25-Nov-2020**	14-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-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
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0082_SD181_201116, 0082_SS179_201116, 0082_SS173_201116, 0082_SS171_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓

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	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	12	**16.67**	**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	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	13	**15.38**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	12	**16.67**	**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	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	13	**15.38**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	12	**8.33**	**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).
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 : **EP2012674**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 15990	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: SC-DEF19009/HEHB SED		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 18-Nov-2020 12:00	Issue Date	: 23-Nov-2020
Client Requested Due Date	: 27-Nov-2020	Scheduled Reporting Date	: **27-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 18.1 - Ice present
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.**

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2012674-001 : 16-Nov-2020 16:22 : 0082_SD161_0.00-0.10_201116

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 - ED007 Def CEC / Exchangeable Cations (ED007) - Default	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2012674-001	16-Nov-2020 16:22	0082_SD161_0.00-0.10...	✓	✓	✓	✓	✓
EP2012674-002	16-Nov-2020 16:38	0082_SD162_201116	✓	✓	✓	✓	✓
EP2012674-003	16-Nov-2020 17:19	0082_SD163_201116	✓	✓	✓	✓	✓
EP2012674-004	16-Nov-2020 17:20	0082_QC101_201116	✓	✓	✓	✓	✓

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

(ALS) COC#: **15990** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHB SED

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: 18/11/2020 1200	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: 18.1 °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_SD161_0.00-0.10		16/11/2020 04:22 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0082_SD162		16/11/2020 04:38 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0082_SD163		16/11/2020 05:19 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0082_QC101		16/11/2020 05:20 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012674

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: **15990** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHB SED

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_SD161_0.00-0.10	HDPE Soil Jar	200 mL	00621019038103	Grey	No	
001	0082_SD161_0.00-0.10	Soil Glass Jar - Unpreserved	150 mL	00260520072482	Orange	No	
002	0082_SD162	HDPE Soil Jar	200 mL	00621019018350	Grey	No	
002	0082_SD162	Soil Glass Jar - Unpreserved	150 mL	00260520053166	Orange	No	
003	0082_SD163	HDPE Soil Jar	200 mL	00621019018019	Grey	No	
003	0082_SD163	Soil Glass Jar - Unpreserved	150 mL	00260520053093	Orange	No	
004	0082_QC101	Soil Glass Jar - Unpreserved	150 mL	00260520053188	Orange	No	
004	0082_QC101	HDPE Soil Jar	200 mL	00621019038094	Grey	No	

Total Bottle Count: ALS: 8, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012674**	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	: 18-Nov-2020 12:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15990	Issue Date	: 27-Nov-2020 19:30
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: SC-DEF19009/HEHB SED		
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 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
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

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	0082_SD161_0.00-0.10_201116	0082_SD162_201116	0082_SD163_201116	0082_QC101_201116	----
			Sampling date / time	16-Nov-2020 16:22	16-Nov-2020 16:38	16-Nov-2020 17:19	16-Nov-2020 17:20	----
Compound	CAS Number	LOR	Unit	EP2012674-001	EP2012674-002	EP2012674-003	EP2012674-004	--------
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.8	8.9	8.4	8.6	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	25800	18100	32400	18700	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	18.6	20.6	35.9	31.5	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	30.6	18.6	21.7	23.4	----
Exchangeable Magnesium	----	0.1	meq/100g	7.6	7.6	10.4	8.7	----
Exchangeable Potassium	----	0.1	meq/100g	0.3	0.4	0.6	0.5	----
Exchangeable Sodium	----	0.1	meq/100g	0.7	0.8	1.8	1.4	----
Cation Exchange Capacity	----	0.1	meq/100g	39.2	27.4	34.6	34.2	----
Exchangeable Sodium Percent	----	0.1	%	1.7	2.9	5.1	4.2	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	5.5	1.1	5.7	3.5	----
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	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<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	<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	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0082_SD161_0.00-0.10_201116	0082_SD162_201116	0082_SD163_201116	0082_QC101_201116	----
			Sampling date / time	16-Nov-2020 16:22	16-Nov-2020 16:38	16-Nov-2020 17:19	16-Nov-2020 17:20	----
Compound	CAS Number	LOR	Unit	EP2012674-001	EP2012674-002	EP2012674-003	EP2012674-004	--------
				Result	Result	Result	Result	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
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	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<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	<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								

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SD161_0.00-0.10_201116	0082_SD162_201116	0082_SD163_201116	0082_QC101_201116	----
				Sampling date / time	16-Nov-2020 16:22	16-Nov-2020 16:38	16-Nov-2020 17:19	16-Nov-2020 17:20	----
Compound	CAS Number	LOR	Unit		EP2012674-001	EP2012674-002	EP2012674-003	EP2012674-004	--------
					Result	Result	Result	Result	----
EP231P: PFAS Sums - Continued									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	**----**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**116**	**102**	**100**	**97.0**	**----**
13C8-PFOA	----	0.0002	%		**105**	**104**	**107**	**108**	**----**

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	: **EP2012674**	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	: 18-Nov-2020
Order number	: DEF19009/0082	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15990	Issue Date	: 27-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: SC-DEF19009/HEHB SED		
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 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
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

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: 3372057)									
EP2012671-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.8	0.00	0% - 20%
EP2012674-002	0082_SD162_201116	EA002: pH Value	----	0.1	pH Unit	8.9	8.7	2.27	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3372056)									
EP2012671-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	61	62	0.00	0% - 20%
EP2012674-002	0082_SD162_201116	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	18100	18100	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3372083)									
EP2012671-001	Anonymous	EA055: Moisture Content	----	0.1	%	19.4	19.0	1.98	0% - 20%
EP2012674-002	0082_SD162_201116	EA055: Moisture Content	----	0.1	%	20.6	20.8	1.14	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3379379)									
EP2012674-002	0082_SD162_201116	ED008: Exchangeable Sodium Percent	----	0.1	%	2.9	2.9	0.00	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	18.6	18.9	1.70	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	7.6	7.7	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	27.4	27.8	1.37	0% - 20%
EP004: Organic Matter (QC Lot: 3372048)									
EP2012671-001	Anonymous	EP004: Organic Matter	----	0.5	%	0.8	0.9	0.00	No Limit
EP2012674-003	0082_SD163_201116	EP004: Organic Matter	----	0.5	%	5.7	5.7	0.00	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3374581)									
EP2012671-001	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	0.0024	0.0028	16.4	0% - 50%

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: 3374581) - continued									
EP2012671-001	Anonymous	EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0011	0.0011	0.00	No Limit
EP2012673-002	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: 3374581)									
EP2012671-001	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
EP2012673-002	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: 3374581)									
EP2012671-001	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
		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

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: 3374581) - continued									
EP2012671-001	Anonymous	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
EP2012673-002	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: 3374581)									
EP2012671-001	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
EP2012673-002	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: 3372057)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3372056)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED008: Exchangeable Cations (QCLot: 3379379)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	89.9	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	98.7	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	114	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	95.4	79.9	110
EP004: Organic Matter (QCLot: 3372048)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	94.8	70.0	120
				<0.5	85 %	85.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374581)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3374581)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	98.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.2	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.2	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	73.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3374581)								

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: 3374581) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	94.6	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	78.5	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	71.8	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.0	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3374581)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	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	78.8	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	93.2	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	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	83.2	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	85.2	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	85.2	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	86.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	107	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	108	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	100	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	104	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	95.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	104	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	105	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	94.4	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	98.0	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: 3374581) - continued							
EP2012671-001	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	97.6	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	98.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	121	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	72.0	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	86.0	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	103	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	83.2	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	77.6	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	100	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	79.6	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	80.0	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3374581)							
EP2012671-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	92.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	87.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	106	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	120	69.2	143

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012674**	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	: 18-Nov-2020
Site	: SC-DEF19009/HEHB SED	Issue Date	: 27-Nov-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 4
Order number	: DEF19009/0082	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)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**19-Nov-2020**	23-Nov-2020	✓	**19-Nov-2020**	19-Nov-2020	✓
0082_SD163_201116,	0082_QC101_201116							
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**19-Nov-2020**	23-Nov-2020	✓	**19-Nov-2020**	17-Dec-2020	✓
0082_SD163_201116,	0082_QC101_201116							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	30-Nov-2020	✓
0082_SD163_201116,	0082_QC101_201116							
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**24-Nov-2020**	14-Dec-2020	✓	**24-Nov-2020**	14-Dec-2020	✓
0082_SD163_201116,	0082_QC101_201116							
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**25-Nov-2020**	14-Dec-2020	✓	**25-Nov-2020**	14-Dec-2020	✓
0082_SD163_201116,	0082_QC101_201116							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
0082_SD163_201116,	0082_QC101_201116							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
0082_SD163_201116,	0082_QC101_201116							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
0082_SD161_0.00-0.10_201116,	0082_SD162_201116,	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
0082_SD163_201116,	0082_QC101_201116							

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)							
0082_SD161_0.00-0.10_201116, 0082_SD162_201116, 0082_SD163_201116, 0082_QC101_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0082_SD161_0.00-0.10_201116, 0082_SD162_201116, 0082_SD163_201116, 0082_QC101_201116	**16-Nov-2020**	**20-Nov-2020**	15-May-2021	✓	**23-Nov-2020**	30-Dec-2020	✓

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	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	4	**25.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	12	**16.67**	**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	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	12	**16.67**	**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	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	12	**8.33**	**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 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 : **EP2012737**

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	: 15984	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB GW - AB		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 18-Nov-2020 12:00	Issue Date	: 18-Nov-2020
Client Requested Due Date	: 27-Nov-2020	Scheduled Reporting Date	: **27-Nov-2020**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 18.1 - Ice 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.
- **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)
EP2012737-001	16-Nov-2020 14:04	0082_MW129_201116	✓	✓	✓	✓	✓	✓	✓
EP2012737-002	16-Nov-2020 14:23	0082_MW130_201116	✓	✓	✓	✓	✓	✓	✓
EP2012737-003	16-Nov-2020 14:54	0082_MW131_201116	✓	✓	✓	✓	✓	✓	✓
EP2012737-004	16-Nov-2020 15:27	0082_MW151_S_201116	✓	✓	✓	✓	✓	✓	✓
EP2012737-005	16-Nov-2020 16:37	0082_MW133_201116	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012737-001	16-Nov-2020 14:04	0082_MW129_201116	✓
EP2012737-002	16-Nov-2020 14:23	0082_MW130_201116	✓
EP2012737-003	16-Nov-2020 14:54	0082_MW131_201116	✓
EP2012737-004	16-Nov-2020 15:27	0082_MW151_S_201116	✓
EP2012737-005	16-Nov-2020 16:37	0082_MW133_201116	✓

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_MW129_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW130_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW131_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW133_20111	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----
0082_MW151_S_201	Clear Plastic Bottle - Natural	----	16-Nov-2020	18-Nov-2020	×	----	----

Requested Deliverables

ACCOUNTS PAYABLE (WA)		
- A4 - AU Tax Invoice (INV)	Email	claire.armstrong@cardno.com.au
CLAIRE ARMSTRONG		
- 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#: 15984 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB GW - AB

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: 18/11/2020 1200	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: 18.1 °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	0082_MW129		16/11/2020 02:04 PM	Water	ALS: 4 Non ALS: 0	No	X		
002	0082_MW130		16/11/2020 02:23 PM	Water	ALS: 4 Non ALS: 0	No	X		
003	0082_MW131		16/11/2020 02:54 PM	Water	ALS: 4 Non ALS: 0	No	X		
004	0082_MW151_S		16/11/2020 03:27 PM	Water	ALS: 4 Non ALS: 0	No	X		
005	0082_MW133		16/11/2020 04:37 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012737

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

(ALS) *COC#:* **15984** *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/HEHB GW - 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, 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	0082_MW129	HDPE (no PTFE)	20 mL	00352005016296	Grey	No	
001	0082_MW129	HDPE (no PTFE)	20 mL	00352005016297	Grey	No	
001	0082_MW129	Clear Plastic Bottle - Natural	250 mL	00070719042829	Green	No	
001	0082_MW129	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023737	Purple	No	
002	0082_MW130	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019022839	Purple	No	
002	0082_MW130	HDPE (no PTFE)	20 mL	00352005016067	Grey	No	
002	0082_MW130	HDPE (no PTFE)	20 mL	00352005016040	Grey	No	
002	0082_MW130	Clear Plastic Bottle - Natural	250 mL	00070719042838	Green	No	
003	0082_MW131	Clear Plastic Bottle - Natural	250 mL	00070719042901	Green	No	
003	0082_MW131	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056654	Purple	No	
003	0082_MW131	HDPE (no PTFE)	20 mL	00352005016110	Grey	No	
003	0082_MW131	HDPE (no PTFE)	20 mL	00352005016222	Grey	No	
004	0082_MW151_S	Clear Plastic Bottle - Natural	250 mL	00070719042848	Green	No	
004	0082_MW151_S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056198	Purple	No	
004	0082_MW151_S	HDPE (no PTFE)	20 mL	00352005016141	Grey	No	
004	0082_MW151_S	HDPE (no PTFE)	20 mL	00352005016309	Grey	No	
005	0082_MW133	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023451	Purple	No	
005	0082_MW133	HDPE (no PTFE)	20 mL	00352005016230	Grey	No	
005	0082_MW133	HDPE (no PTFE)	20 mL	00352005016248	Grey	No	
005	0082_MW133	Clear Plastic Bottle - Natural	250 mL	00070719042789	Green	No	

Total Bottle Count: ALS: 20, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012737**	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	: 18-Nov-2020 12:00
Order number	: DEF19009/0083	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15984	Issue Date	: 26-Nov-2020 23:08
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB GW - AB		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		

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
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	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.
- 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**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_MW129_201116	0082_MW130_201116	0082_MW131_201116	0082_MW151_S_201116	0082_MW133_201116
				Sampling date / time	16-Nov-2020 14:04	16-Nov-2020 14:23	16-Nov-2020 14:54	16-Nov-2020 15:27	16-Nov-2020 16:37
					EP2012737-001	EP2012737-002	EP2012737-003	EP2012737-004	EP2012737-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.83**	**7.85**	**7.70**	**7.72**	**7.79**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**41900**	**35200**	**35600**	**40900**	**29200**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**1020**	**602**	**240**	**214**	**112**
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		**156**	**186**	**266**	**213**	**303**
Total Alkalinity as CaCO3	----	1	mg/L		**156**	**186**	**266**	**213**	**303**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**2760**	**2570**	**2370**	**2670**	**2390**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**20700**	**19800**	**17700**	**20600**	**17700**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**522**	**527**	**586**	**545**	**521**
Magnesium	7439-95-4	1	mg/L		**1560**	**1400**	**1330**	**1520**	**1320**
Sodium	7440-23-5	1	mg/L		**12100**	**11000**	**10100**	**11800**	**10600**
Potassium	7440-09-7	1	mg/L		**662**	**568**	**519**	**658**	**586**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**644**	**616**	**554**	**641**	**555**
ø Total Cations	----	0.01	meq/L		**698**	**634**	**591**	**682**	**611**
ø Ionic Balance	----	0.01	%		**3.96**	**1.50**	**3.26**	**3.13**	**4.77**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		<1	**3**	**6**	<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	<0.02	<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	0082_MW129_201116	0082_MW130_201116	0082_MW131_201116	0082_MW151_S_201116	0082_MW133_201116
				Sampling date / time	16-Nov-2020 14:04	16-Nov-2020 14:23	16-Nov-2020 14:54	16-Nov-2020 15:27	16-Nov-2020 16:37
					EP2012737-001	EP2012737-002	EP2012737-003	EP2012737-004	EP2012737-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.02**	**0.02**	<0.01	**0.06**
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	0082_MW129_201116	0082_MW130_201116	0082_MW131_201116	0082_MW151_S_201116	0082_MW133_201116
				Sampling date / time	16-Nov-2020 14:04	16-Nov-2020 14:23	16-Nov-2020 14:54	16-Nov-2020 15:27	16-Nov-2020 16:37
					EP2012737-001	EP2012737-002	EP2012737-003	EP2012737-004	EP2012737-005
					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	**0.06**	<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	**0.02**	**0.08**	<0.01	**0.06**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**0.02**	**0.02**	<0.01	**0.06**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.02**	**0.08**	<0.01	**0.06**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**88.4**	**94.9**	**92.7**	**90.9**	**95.6**
13C8-PFOA	----	0.02	%		**88.3**	**88.9**	**90.3**	**86.5**	**89.1**

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	: **EP2012737**	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	: 18-Nov-2020
Order number	: DEF19009/0083	Date Analysis Commenced	: 19-Nov-2020
C-O-C number	: 15984	Issue Date	: 26-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB GW - AB		
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 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
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	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: **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: 3381087)									
EP2012669-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.58	7.57	0.132	0% - 20%
EP2012670-005	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.97	7.96	0.126	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3381089)									
EP2012846-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.87	7.93	0.759	0% - 20%
EP2012773-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.92	7.96	0.504	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3377855)									
EP2012736-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	288	290	0.346	0% - 20%
EP2012765-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	236	242	2.51	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3377856)									
EP2012737-001	0082_MW129_201116	EA025H: Suspended Solids (SS)	----	5	mg/L	1020	1060	4.00	0% - 20%
EP2012773-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	14	12	16.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3381086)									
EP2012669-002	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	481	526	8.79	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	481	526	8.79	0% - 20%
EP2012670-005	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	121	120	1.38	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	120	1.38	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3381088)									
EP2012775-006	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	63	62	1.61	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: 3381088) - continued									
EP2012775-006	Anonymous	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	63	62	1.61	0% - 20%
EP2012773-001	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	169	169	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	169	169	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373835)									
EP2012737-001	0082_MW129_201116	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2760	2760	0.0600	0% - 20%
EP2012737-005	0082_MW133_201116	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2390	2380	0.239	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373836)									
EP2012737-001	0082_MW129_201116	ED045G: Chloride	16887-00-6	1	mg/L	20700	20700	0.263	0% - 20%
EP2012737-005	0082_MW133_201116	ED045G: Chloride	16887-00-6	1	mg/L	17700	17600	0.547	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3372625)									
EP2012669-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	274	265	3.52	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	492	477	3.11	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	4320	4160	3.94	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	223	216	3.12	0% - 20%
EP2012670-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	504	477	5.39	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1650	1530	7.09	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	12700	11700	7.88	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	696	637	8.84	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3373052)									
EP2012669-007	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	2	0.00	No Limit
EP2012737-002	0082_MW130_201116	EP002: Dissolved Organic Carbon	----	1	mg/L	3	4	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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

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: 3377798) - continued									
ES2041195-019	Anonymous	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: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3377798)									
ES2041195-019	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: 3381087)								
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: 3381089)								
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: 3377855)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3377856)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	110	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3381086)								
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	98.0	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3381088)								
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	97.9	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373835)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373836)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	87.9	114
				<1	1000 mg/L	102	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3372625)								
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	103	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: 3372625) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	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: 3373052)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	104	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3377798)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	96.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	98.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	93.8	69.0	134
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	97.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3377798)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	81.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	80.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	92.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	80.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	81.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	98.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	98.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	83.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	99.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	98.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	84.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3377798)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	105	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	83.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	83.8	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	80.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	84.1	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	109	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	92.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3377798)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	104	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	Recovery Limits (%): Low	Recovery Limits (%): High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3377798) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	90.0	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	88.2	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	89.2	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: 3373835)							
EP2012737-001	0082_MW129_201116	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373836)							
EP2012737-001	0082_MW129_201116	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3373052)							
EP2012670-001	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	82.2	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	85.8	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.0	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	98.8	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	83.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	87.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	85.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	78.4	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	93.8	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	79.6	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	81.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.0	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	80.4	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	104	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	90.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	81.4	71.0	132

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: 3377798)							
ES2041195-019	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	83.0	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	83.3	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	80.2	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	83.3	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	98.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	94.2	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3377798)							
ES2041195-019	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	101	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	93.2	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	91.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	109	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012737**	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	: 18-Nov-2020
Site	: DEF19009/HEHB GW - AB	Issue Date	: 26-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 5
Order number	: DEF19009/0083	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.**
- **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	EP2012737--001	0082_MW129_201116	**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	EP2012737--001	0082_MW129_201116	**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							
0082_MW129_201116,	0082_MW130_201116,	----	----	----	24-Nov-2020	16-Nov-2020	**8**
0082_MW131_201116,	0082_MW151_S_201116,						
0082_MW133_201116							

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	17	5.88	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

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_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	16-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**23-Nov-2020**	23-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**24-Nov-2020**	30-Nov-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**26-Nov-2020**	14-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**26-Nov-2020**	14-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	23-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**----**	----	----	**19-Nov-2020**	14-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)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW129_201116, 0082_MW130_201116, 0082_MW131_201116, 0082_MW151_S_201116, 0082_MW133_201116	**16-Nov-2020**	**24-Nov-2020**	15-May-2021	✓	**25-Nov-2020**	15-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	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	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	1	17	**5.88**	**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	11	**18.18**	**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	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	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	17	**5.88**	**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	11	**18.18**	**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	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	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	17	**5.88**	**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	11	**9.09**	**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	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	17	**5.88**	**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.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012738**

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	: 16029	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 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)
EP2012738-001	17-Nov-2020 10:22	0082_MW145_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-002	17-Nov-2020 10:46	0082_MW326_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-003	17-Nov-2020 10:48	0082_QC104_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-004	17-Nov-2020 11:17	0082_MW109_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-005	17-Nov-2020 11:58	0082_MW113_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-006	17-Nov-2020 12:00	0082_QC106_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-007	17-Nov-2020 12:15	0082_MW115_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-008	17-Nov-2020 12:29	0082_MW103D_201117	✓	✓	✓	✓	✓	✓	✓
EP2012738-009	17-Nov-2020 12:41	0082_MW315_201117	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012738-001	17-Nov-2020 10:22	0082_MW145_201117	✓
EP2012738-002	17-Nov-2020 10:46	0082_MW326_201117	✓
EP2012738-003	17-Nov-2020 10:48	0082_QC104_201117	✓
EP2012738-004	17-Nov-2020 11:17	0082_MW109_201117	✓
EP2012738-005	17-Nov-2020 11:58	0082_MW113_201117	✓
EP2012738-006	17-Nov-2020 12:00	0082_QC106_201117	✓
EP2012738-007	17-Nov-2020 12:15	0082_MW115_201117	✓
EP2012738-008	17-Nov-2020 12:29	0082_MW103D_201117	✓
EP2012738-009	17-Nov-2020 12:41	0082_MW315_201117	✓
EP2012738-010	17-Nov-2020 17:36	0082_QC401_201117	✓
EP2012738-011	17-Nov-2020 17:38	0082_QC402_201117	✓
EP2012738-012	17-Nov-2020 17:39	0082_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							
0082_MW103D_2011	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW109_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW113_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW115_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW145_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW315_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW326_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_QC104_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_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

ALS

Environmental Division
Perth
Work Order Reference
EP2012738

Telephone : +61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEP19009 **Client:** CARBO

Project Manager: M. Bowdler
Phone: ( )

ALS Compass COC Reference: 1629 **# Samples:**
16099, 16098

Sampler: S. McCulloch
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

COC#: **16029** *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/HEHB GW

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, maelie.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
~~001~~	~~0082_MW145~~		~~17/11/2020 10:22 AM~~	~~Water~~	~~ALS: 4 Non ALS: 0~~	~~No~~	~~X~~			
002	0082_MW326		17/11/2020 10:46 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0082_QC104		17/11/2020 10:48 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0082_MW109		17/11/2020 11:17 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0082_MW113		17/11/2020 11:58 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0082_QC106		17/11/2020 12:00 PM	Water	ALS: 4 Non ALS: 0	No	X			
007	0082_MW115		17/11/2020 12:15 PM	Water	ALS: 4 Non ALS: 0	No	X			
008	0082_MW103D		17/11/2020 12:29 PM	Water	ALS: 4 Non ALS: 0	No	X			
009	0082_MW315		17/11/2020 12:41 PM	Water	ALS: 4 Non ALS: 0	No	X			

CHAIN OF CUSTODY

(ALS) COC#: **16029** *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/HEHB GW

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

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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~~	~~0082_QC401~~		~~17/11/2020 05:36 PM~~	~~Water~~	~~ALS: 2 Non ALS: 0~~	~~No~~		~~X~~		
011	0082_QC402		17/11/2020 05:38 PM	Water	ALS: 2 Non ALS: 0	No		X		
012	0082_QC403		17/11/2020 05:39 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

ALS COC#: 16029 *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/HEHB GW

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

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SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0082_MW145	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056587	Purple	No	
001	0082_MW145	Clear Plastic Bottle - Natural	250 mL	00070719042825	Green	No	
001	0082_MW145	HDPE (no PTFE)	20 mL	00352005016274	Grey	No	
001	0082_MW145	HDPE (no PTFE)	20 mL	00352005016307	Grey	No	
002	0082_MW326	Clear Plastic Bottle - Natural	250 mL	00070719042892	Green	No	
002	0082_MW326	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023337	Purple	No	
002	0082_MW326	HDPE (no PTFE)	20 mL	00352005016224	Grey	No	
002	0082_MW326	HDPE (no PTFE)	20 mL	00352005016273	Grey	No	
003	0082_QC104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023763	Purple	No	
003	0082_QC104	Clear Plastic Bottle - Natural	250 mL	00070719042882	Green	No	
003	0082_QC104	HDPE (no PTFE)	20 mL	00352005016054	Grey	No	
003	0082_QC104	HDPE (no PTFE)	20 mL	00352005016264	Grey	No	
004	0082_MW109	Clear Plastic Bottle - Natural	250 mL	00070719042813	Green	No	
004	0082_MW109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056635	Purple	No	
004	0082_MW109	HDPE (no PTFE)	20 mL	00352005016201	Grey	No	
004	0082_MW109	HDPE (no PTFE)	20 mL	00352005016208	Grey	No	
005	0082_MW113	Clear Plastic Bottle - Natural	250 mL	00070719042779	Green	No	
005	0082_MW113	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023731	Purple	No	
005	0082_MW113	HDPE (no PTFE)	20 mL	00352005016216	Grey	No	
005	0082_MW113	HDPE (no PTFE)	20 mL	00352005016203	Grey	No	
006	0082_QC106	Clear Plastic Bottle - Natural	250 mL	00070719042904	Green	No	
006	0082_QC106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056648	Purple	No	
006	0082_QC106	HDPE (no PTFE)	20 mL	00352005016262	Grey	No	
006	0082_QC106	HDPE (no PTFE)	20 mL	00352005016213	Grey	No	
007	0082_MW115	Clear Plastic Bottle - Natural	250 mL	00070719042834	Green	No	
007	0082_MW115	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023410	Purple	No	

CHAIN OF CUSTODY

COC#: **16029** *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/HEHB GW

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

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007	0082_MW115	HDPE (no PTFE)	20 mL	00352005016239	Grey	No	
007	0082_MW115	HDPE (no PTFE)	20 mL	00352005016206	Grey	No	
008	0082_MW103D	Clear Plastic Bottle - Natural	250 mL	00070719042787	Green	No	
008	0082_MW103D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023272	Purple	No	
008	0082_MW103D	HDPE (no PTFE)	20 mL	00352005016092	Grey	No	
008	0082_MW103D	HDPE (no PTFE)	20 mL	00352005016127	Grey	No	
009	0082_MW315	HDPE (no PTFE)	20 mL	00350019106634	Grey	No	
009	0082_MW315	HDPE (no PTFE)	20 mL	00350019106723	Grey	No	
009	0082_MW315	Clear Plastic Bottle - Natural	250 mL	00070719042066	Green	No	
009	0082_MW315	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023142	Purple	No	
010	0082_QC401	HDPE (no PTFE)	20 mL	00352005006415	Grey	No	
010	0082_QC401	HDPE (no PTFE)	20 mL	00352005006544	Grey	No	
011	0082_QC402	HDPE (no PTFE)	20 mL	00352005005180	Grey	No	
011	0082_QC402	HDPE (no PTFE)	20 mL	00352005005225	Grey	No	
012	0082_QC403	HDPE (no PTFE)	20 mL	00352005005116	Grey	No	
012	0082_QC403	HDPE (no PTFE)	20 mL	00352005005173	Grey	No	

Total Bottle Count: ALS: 42, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012738**	Page	: 1 of 11
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	: 16029	Issue Date	: 27-Nov-2020 18:33
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		

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

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): Samples EP2012738-5 and 6 were centrifuged before analysis to reduce possible interference from sediment which may consume the alkalinity titrant.
- TDS by method EA-015 may bias high for sample #8 and #9 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**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_MW145_201117	0082_MW326_201117	0082_QC104_201117	0082_MW109_201117	0082_MW113_201117
				Sampling date / time	17-Nov-2020 10:22	17-Nov-2020 10:46	17-Nov-2020 10:48	17-Nov-2020 11:17	17-Nov-2020 11:58
					EP2012738-001	EP2012738-002	EP2012738-003	EP2012738-004	EP2012738-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.56	7.55	7.51	7.92	8.17
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		34100	26400	26800	6300	2110
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		432	2400	8370	3190	63000
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		248	429	388	605	522
Total Alkalinity as CaCO3	----	1	mg/L		248	429	388	605	522
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2560	2520	2600	794	193
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19000	14200	14400	2960	703
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		615	443	435	66	24
Magnesium	7439-95-4	1	mg/L		1240	887	860	92	30
Sodium	7440-23-5	1	mg/L		10800	8680	8260	2080	613
Potassium	7440-09-7	1	mg/L		549	359	346	105	40
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		594	462	468	112	34.3
ø Total Cations	----	0.01	meq/L		616	482	461	104	31.4
ø Ionic Balance	----	0.01	%		1.84	2.14	0.80	3.74	4.46
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		1	2	7	3	2
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	0.64	0.03
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	0.90	0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	0.06	0.05	8.10	0.22
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	0.25	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW145_201117	0082_MW326_201117	0082_QC104_201117	0082_MW109_201117	0082_MW113_201117
				Sampling date / time	17-Nov-2020 10:22	17-Nov-2020 10:46	17-Nov-2020 10:48	17-Nov-2020 11:17	17-Nov-2020 11:58
Compound	CAS Number	LOR	Unit		EP2012738-001	EP2012738-002	EP2012738-003	EP2012738-004	EP2012738-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**0.07**	**0.04**	**2.22**	**0.06**
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	**0.19**	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.02	<0.02	**1.21**	**0.03**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.02	<0.02	**0.07**	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.18**	<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	0082_MW145_201117	0082_MW326_201117	0082_QC104_201117	0082_MW109_201117	0082_MW113_201117
				Sampling date / time	17-Nov-2020 10:22	17-Nov-2020 10:46	17-Nov-2020 10:48	17-Nov-2020 11:17	17-Nov-2020 11:58
					EP2012738-001	EP2012738-002	EP2012738-003	EP2012738-004	EP2012738-005
					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	**0.13**	**0.09**	**13.8**	**0.36**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**0.13**	**0.09**	**10.3**	**0.28**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**0.13**	**0.09**	**12.6**	**0.34**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**108**	**112**	**106**	**117**	**111**
13C8-PFOA	----	0.02	%		**112**	**116**	**115**	**104**	**103**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_QC106_201117	0082_MW115_201117	0082_MW103D_201117	0082_MW315_201117	----
				Sampling date / time	17-Nov-2020 12:00	17-Nov-2020 12:15	17-Nov-2020 12:29	17-Nov-2020 12:41	----
Compound	CAS Number	LOR	Unit		EP2012738-006	EP2012738-007	EP2012738-008	EP2012738-009	--------
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.21	7.76	7.65	8.36	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		2120	3010	4730	941	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		74500	912	666	556	----
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	12	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		579	304	227	689	----
Total Alkalinity as CaCO3	----	1	mg/L		579	304	227	702	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		193	294	169	46	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		725	1440	1900	66	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		23	109	288	7	----
Magnesium	7439-95-4	1	mg/L		30	134	162	8	----
Sodium	7440-23-5	1	mg/L		613	733	692	300	----
Potassium	7440-09-7	1	mg/L		39	91	31	25	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		36.0	52.8	61.6	16.8	----
ø Total Cations	----	0.01	meq/L		31.3	50.7	58.6	14.7	----
ø Ionic Balance	----	0.01	%		7.07	2.06	2.54	6.81	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		3	3	2	2	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		0.03	0.17	0.20	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		0.02	0.25	0.22	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		0.22	3.68	2.05	0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	0.20	0.11	<0.02	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_QC106_201117	0082_MW115_201117	0082_MW103D_201117	0082_MW315_201117	----
				Sampling date / time	17-Nov-2020 12:00	17-Nov-2020 12:15	17-Nov-2020 12:29	17-Nov-2020 12:41	----
Compound	CAS Number	LOR	Unit		EP2012738-006	EP2012738-007	EP2012738-008	EP2012738-009	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.07**	**12.2**	**4.03**	**0.10**	----
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	**1.0**	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**2.61**	**0.19**	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.03**	**2.11**	**0.50**	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**0.93**	**0.07**	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.55**	**0.08**	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	**0.03**	<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	0082_QC106_201117	0082_MW115_201117	0082_MW103D_201117	0082_MW315_201117	----
				Sampling date / time	17-Nov-2020 12:00	17-Nov-2020 12:15	17-Nov-2020 12:29	17-Nov-2020 12:41	----
Compound	CAS Number	LOR	Unit		EP2012738-006	EP2012738-007	EP2012738-008	EP2012738-009	--------
					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	**6.08**	**0.06**	<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		**0.37**	**29.8**	**7.51**	**0.12**	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.29**	**15.9**	**6.08**	**0.12**	**----**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.35**	**29.3**	**7.18**	**0.12**	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**116**	**117**	**103**	**113**	**----**
13C8-PFOA	----	0.02	%		**109**	**110**	**102**	**110**	**----**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC401_201117	0082_QC402_201117	0082_QC403_201117	----	----
				Sampling date / time	17-Nov-2020 17:36	17-Nov-2020 17:38	17-Nov-2020 17:39	----	----
Compound	CAS Number	LOR	Unit		EP2012738-010	EP2012738-011	EP2012738-012	--------	--------
					Result	Result	Result	----	----
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	----	----
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	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC401_201117	0082_QC402_201117	0082_QC403_201117	----	----
				Sampling date / time	17-Nov-2020 17:36	17-Nov-2020 17:38	17-Nov-2020 17:39	----	----
Compound	CAS Number	LOR	Unit		EP2012738-010	EP2012738-011	EP2012738-012	--------	--------
					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	----	----
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	----	----
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	%		**115**	**112**	**110**	----	----
13C8-PFOA	----	0.02	%		**110**	**103**	**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

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	: **EP2012738**	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	: DEF19009/0082	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16029	Issue Date	: 27-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/HEHB		
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 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

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: 3383649)									
EP2012696-005	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.91	7.92	0.126	0% - 20%
EP2012841-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.68	7.67	0.130	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3380138)									
EP2012738-001	0082_MW145_201117	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	34100	33800	0.942	0% - 20%
EP2012738-009	0082_MW315_201117	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	0082_MW145_201117	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: 3383651)									
EP2012736-001	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	66	69	5.25	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	66	69	5.25	0% - 20%
EP2012841-002	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	149	149	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	149	149	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373835)									
EP2012737-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2760	2760	0.0600	0% - 20%
EP2012737-005	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2390	2380	0.239	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3373836)									
EP2012737-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	20700	20700	0.263	0% - 20%
EP2012737-005	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	17700	17600	0.547	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	0082_MW145_201117	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%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3379028)									
EP2012738-001	0082_MW145_201117	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

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: 3383649)								
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: 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: 3383651)								
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	116	81.2	126
				<1	200 mg/L	98.1	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3373835)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3373836)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	87.9	114
				<1	1000 mg/L	102	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
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
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3382116)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	76.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	84.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	83.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	81.8	69.0	134

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3382116) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	89.6	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: 3382116)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	82.1	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	95.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	89.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	93.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	97.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	93.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	86.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	105	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	94.6	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	83.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3382116)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	76.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	88.7	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	96.6	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	76.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	77.5	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	86.2	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	77.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3382116)								
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	97.6	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	84.6	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	80.6	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: 3373835)							
EP2012737-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373836)							
EP2012737-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3379028)							
EP2012738-002	0082_MW326_201117	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012738**	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	: 27-Nov-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 12
Order number	: DEF19009/0082	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	EP2012737--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	EP2012737--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							
0082_MW145_201117,	0082_MW326_201117,	----	----	----	25-Nov-2020	17-Nov-2020	**8**
0082_QC104_201117,	0082_MW109_201117,						
0082_MW113_201117,	0082_QC106_201117,						
0082_MW115_201117,	0082_MW103D_201117,						
0082_MW315_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	15	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	15	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)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117	**17-Nov-2020**	**----**	----	----	**25-Nov-2020**	17-Nov-2020	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_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_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117	**17-Nov-2020**	**----**	----	----	**25-Nov-2020**	01-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117	**17-Nov-2020**	**----**	----	----	**26-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
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	24-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117	**17-Nov-2020**	**----**	----	----	**23-Nov-2020**	15-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117, 0082_QC401_201117, 0082_QC402_201117, 0082_QC403_201117	**17-Nov-2020**	**25-Nov-2020**	16-May-2021	✓	**25-Nov-2020**	16-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117, 0082_QC401_201117, 0082_QC402_201117, 0082_QC403_201117	**17-Nov-2020**	**25-Nov-2020**	16-May-2021	✓	**25-Nov-2020**	16-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW145_201117, 0082_MW326_201117, 0082_QC104_201117, 0082_MW109_201117, 0082_MW113_201117, 0082_QC106_201117, 0082_MW115_201117, 0082_MW103D_201117, 0082_MW315_201117, 0082_QC401_201117, 0082_QC402_201117, 0082_QC403_201117	**17-Nov-2020**	**25-Nov-2020**	16-May-2021	✓	**25-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_MW145_201117,	0082_MW326_201117,	**17-Nov-2020**	**25-Nov-2020**	16-May-2021	✓	**25-Nov-2020**	16-May-2021	✓
0082_QC104_201117,	0082_MW109_201117,							
0082_MW113_201117,	0082_QC106_201117,							
0082_MW115_201117,	0082_MW103D_201117,							
0082_MW315_201117,	0082_QC401_201117,							
0082_QC402_201117,	0082_QC403_201117							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0082_MW145_201117,	0082_MW326_201117,	**17-Nov-2020**	**25-Nov-2020**	16-May-2021	✓	**25-Nov-2020**	16-May-2021	✓
0082_QC104_201117,	0082_MW109_201117,							
0082_MW113_201117,	0082_QC106_201117,							
0082_MW115_201117,	0082_MW103D_201117,							
0082_MW315_201117,	0082_QC401_201117,							
0082_QC402_201117,	0082_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	19	**10.53**	**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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	15	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	19	**10.53**	**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	2	19	**10.53**	**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	1	20	**5.00**	**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
pH by PC Titrator	EA005-P	2	19	**10.53**	**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	1	19	**5.26**	**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	1	20	**5.00**	**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
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	0	15	**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.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012739**

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	: 16037	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 9 / 9

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)
EP2012739-001	17-Nov-2020 10:42	0082_MW144_S_201117	✓	✓	✓	✓	✓	✓	✓
EP2012739-002	17-Nov-2020 10:46	0082_QC103_201117	✓	✓	✓	✓	✓	✓	✓
EP2012739-003	17-Nov-2020 11:22	0082_MW310_201117	✓	✓	✓	✓	✓	✓	✓
EP2012739-004	17-Nov-2020 11:39	0082_MW142_201117	✓	✓	✓	✓	✓	✓	✓
EP2012739-005	17-Nov-2020 12:07	0082_MW311_201117	✓	✓	✓	✓	✓	✓	✓
EP2012739-006	17-Nov-2020 12:25	0082_MW143_201117	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012739-001	17-Nov-2020 10:42	0082_MW144_S_201117	✓
EP2012739-002	17-Nov-2020 10:46	0082_QC103_201117	✓
EP2012739-003	17-Nov-2020 11:22	0082_MW310_201117	✓
EP2012739-004	17-Nov-2020 11:39	0082_MW142_201117	✓
EP2012739-005	17-Nov-2020 12:07	0082_MW311_201117	✓
EP2012739-006	17-Nov-2020 12:25	0082_MW143_201117	✓
EP2012739-007	17-Nov-2020 17:35	0082_QC301_201117	✓
EP2012739-008	17-Nov-2020 17:36	0082_QC302_201117	✓
EP2012739-009	17-Nov-2020 17:36	0082_QC303_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_MW142_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----
0082_MW143_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	×	----	----

0082_MW144_S_201	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0082_MW310_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0082_MW311_20111	Clear Plastic Bottle - Natural	----	17-Nov-2020	19-Nov-2020	✘	----	----
0082_QC103_201117	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
EP2012739

Telephone : +61-8-9406 1301

ALSCompass SAMPLING Intelligence

Custody Document for Submissions via ALS Compass App

Project: DEP19009 **Client:** CTRONO. **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:	**Date / Time:**	**Date / Time:**	**Date / Time:**
18/11/20			19-11-20 1050

CHAIN OF CUSTODY

(ALS) COC#: **16037** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB GW_ab

ORDER NO: DEF19009/0082

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

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~~	~~0082_MW144_S~~		~~17/11/2020 10:42 AM~~	~~Water~~	~~ALS: 6 Non ALS: 0~~	~~No~~	X			
002	0082_QC103_201117		17/11/2020 10:46 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0082_MW310		17/11/2020 11:22 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0082_MW142		17/11/2020 11:39 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0082_MW311		17/11/2020 12:07 PM	Water	ALS: 4 Non ALS: 0	No	X			
006	0082_MW143		17/11/2020 12:25 PM	Water	ALS: 4 Non ALS: 0	No	X			
007	0082_QC301		17/11/2020 05:35 PM	Water	ALS: 2 Non ALS: 0	No		X		
008	0082_QC302		17/11/2020 05:36 PM	Water	ALS: 2 Non ALS: 0	No		X		
009	0082_QC303		17/11/2020 05:36 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

ALS COC#: 16037 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB GW_ab

ORDER NO: DEF19009/0082

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

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_MW144_S	Clear Plastic Bottle - Natural	250 mL	00070719042897	Green	No	
001	0082_MW144_S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023573	Purple	No	
001	0082_MW144_S	HDPE (no PTFE)	20 mL	00352005007000	Grey	No	
001	0082_MW144_S	HDPE (no PTFE)	20 mL	00352005007064	Grey	No	
001	0082_MW144_S	HDPE (no PTFE)	20 mL	00352005016263	Grey	No	
001	0082_MW144_S	HDPE (no PTFE)	20 mL	00352005006966	Grey	No	
002	0082_QC103_201117	Clear Plastic Bottle - Natural	250 mL	00070719042818	Green	No	
002	0082_QC103_201117	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023403	Purple	No	
002	0082_QC103_201117	HDPE (no PTFE)	20 mL	00352005016314	Grey	No	
002	0082_QC103_201117	HDPE (no PTFE)	20 mL	00352005007256	Grey	No	
003	0082_MW310	Clear Plastic Bottle - Natural	250 mL	00070719042799	Green	No	
003	0082_MW310	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023474	Purple	No	
003	0082_MW310	HDPE (no PTFE)	20 mL	00352005016076	Grey	No	
003	0082_MW310	HDPE (no PTFE)	20 mL	00352005016238	Grey	No	
004	0082_MW142	HDPE (no PTFE)	20 mL	00352005016217	Grey	No	
004	0082_MW142	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220065445	Purple	No	
004	0082_MW142	HDPE (no PTFE)	20 mL	00352005016051	Grey	No	
004	0082_MW142	Clear Plastic Bottle - Natural	250 mL	00070719042690	Green	No	
005	0082_MW311	HDPE (no PTFE)	20 mL	00352005016123	Grey	No	
005	0082_MW311	HDPE (no PTFE)	20 mL	00352005016081	Grey	No	
005	0082_MW311	Clear Plastic Bottle - Natural	250 mL	00070719042797	Green	No	
005	0082_MW311	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023346	Purple	No	
006	0082_MW143	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023388	Purple	No	
006	0082_MW143	Clear Plastic Bottle - Natural	250 mL	00070719042823	Green	No	
006	0082_MW143	HDPE (no PTFE)	20 mL	00352005016115	Grey	No	
006	0082_MW143	HDPE (no PTFE)	20 mL	00352005016180	Grey	No	

CHAIN OF CUSTODY

(ALS) COC#: **16037** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB GW_ab

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:

007	0082_QC301	HDPE (no PTFE)	20 mL	00352005005308	Grey	No	
007	0082_QC301	HDPE (no PTFE)	20 mL	00352005006445	Grey	No	
008	0082_QC302	HDPE (no PTFE)	20 mL	00352005005267	Grey	No	
008	0082_QC302	HDPE (no PTFE)	20 mL	00352005006266	Grey	No	
009	0082_QC303	HDPE (no PTFE)	20 mL	00352005006550	Grey	No	
009	0082_QC303	HDPE (no PTFE)	20 mL	00352005005227	Grey	No	

Total Bottle Count: ALS: 32, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012739**	Page	: 1 of 11
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	: 16037	Issue Date	: 30-Nov-2020 17:42
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 9		
No. of samples analysed	: 9		

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.
- 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_MW144_S_201117	0082_QC103_201117	0082_MW310_201117	0082_MW142_201117	0082_MW311_201117
				Sampling date / time	17-Nov-2020 10:42	17-Nov-2020 10:46	17-Nov-2020 11:22	17-Nov-2020 11:39	17-Nov-2020 12:07
Compound	CAS Number	LOR	Unit		EP2012739-001	EP2012739-002	EP2012739-003	EP2012739-004	EP2012739-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.09	8.16	8.08	7.85	8.19
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		1620	1620	2920	2940	453
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		2270	1900	711	156	452
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		556	591	694	358	338
Total Alkalinity as CaCO3	----	1	mg/L		556	591	694	358	338
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		147	145	316	149	19
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		508	510	1020	1320	33
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		18	18	34	137	25
Magnesium	7439-95-4	1	mg/L		10	10	62	133	13
Sodium	7440-23-5	1	mg/L		512	521	894	641	111
Potassium	7440-09-7	1	mg/L		26	26	58	63	24
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		28.5	29.2	49.2	47.5	8.08
ø Total Cations	----	0.01	meq/L		24.6	25.0	47.2	47.3	7.76
ø Ionic Balance	----	0.01	%		7.23	7.68	2.12	0.23	2.02
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		<1	1	3	<1	2
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		0.20	0.20	2.39	0.03	0.03
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		0.28	0.29	1.78	0.05	0.04
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		2.09	2.10	3.04	0.74	0.36
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		0.09	0.10	0.06	0.06	<0.02

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW144_S_201117	0082_QC103_201117	0082_MW310_201117	0082_MW142_201117	0082_MW311_201117
				Sampling date / time	17-Nov-2020 10:42	17-Nov-2020 10:46	17-Nov-2020 11:22	17-Nov-2020 11:39	17-Nov-2020 12:07
Compound	CAS Number	LOR	Unit		EP2012739-001	EP2012739-002	EP2012739-003	EP2012739-004	EP2012739-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**5.97**	**6.88**	**0.65**	**5.92**	**0.55**
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		**0.6**	**0.6**	**1.3**	**0.1**	**0.2**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**1.43**	**1.46**	**3.88**	**0.29**	**0.48**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**1.46**	**1.44**	**7.35**	**0.33**	**0.35**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**1.48**	**1.46**	**0.64**	**0.12**	**0.12**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.58**	**0.59**	**0.12**	**0.14**	**0.05**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.24**	**0.26**	<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	0082_MW144_S_201117	0082_QC103_201117	0082_MW310_201117	0082_MW142_201117	0082_MW311_201117
				Sampling date / time	17-Nov-2020 10:42	17-Nov-2020 10:46	17-Nov-2020 11:22	17-Nov-2020 11:39	17-Nov-2020 12:07
					EP2012739-001	EP2012739-002	EP2012739-003	EP2012739-004	EP2012739-005
					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		**0.33**	**0.33**	<0.05	**1.22**	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**0.35**	**0.37**	<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		**15.1**	**16.1**	**21.2**	**9.00**	**2.18**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**8.06**	**8.98**	**3.69**	**6.66**	**0.91**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**14.5**	**15.4**	**19.4**	**8.89**	**2.14**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**104**	**109**	**108**	**105**	**113**
13C8-PFOA	----	0.02	%		**118**	**119**	**119**	**117**	**118**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW143_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 12:25	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012739-006	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**8.39**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**803**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**154**	----	----	----	----
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		**13**	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**429**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**442**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**38**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**156**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**8**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**8**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**245**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**32**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**14.0**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**12.5**	----	----	----	----
ø Ionic Balance	----	0.01	%		**5.61**	----	----	----	----
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		**0.04**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.05**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.53**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.11**	----	----	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW143_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 12:25	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012739-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**4.81**	----	----	----	----
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		**0.4**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**1.03**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.92**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.57**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.37**	----	----	----	----
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	0082_MW143_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 12:25	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012739-006	--------	--------	--------	--------
					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		**0.87**	----	----	----	----
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		**9.70**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**5.34**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**9.54**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**106**	----	----	----	----
13C8-PFOA	----	0.02	%		**112**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC301_201117	0082_QC302_201117	0082_QC303_201117	----	----
				Sampling date / time	17-Nov-2020 17:35	17-Nov-2020 17:36	17-Nov-2020 17:36	----	----
Compound	CAS Number	LOR	Unit		EP2012739-007	EP2012739-008	EP2012739-009	--------	--------
					Result	Result	Result	----	----
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	----	----
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	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC301_201117	0082_QC302_201117	0082_QC303_201117	----	----
				Sampling date / time	17-Nov-2020 17:35	17-Nov-2020 17:36	17-Nov-2020 17:36	----	----
Compound	CAS Number	LOR	Unit		EP2012739-007	EP2012739-008	EP2012739-009	--------	--------
					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	----	----
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	----	----
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	%		**109**	**116**	**113**	----	----
13C8-PFOA	----	0.02	%		**115**	**118**	**112**	----	----

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	: **EP2012739**	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	: DEF19009/0082	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16037	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 9		
No. of samples analysed	: 9		

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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: **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	0082_MW144_S_201117	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%
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%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3380140)									
EP2012739-006	0082_MW143_201117	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: 3380139)									
EP2012738-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	432	453	4.81	0% - 20%
EP2012739-002	0082_QC103_201117	EA025H: Suspended Solids (SS)	----	5	mg/L	1900	1890	0.343	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3380141)									
EP2012739-006	0082_MW143_201117	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	0082_MW144_S_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	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%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373829)									

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 (%)*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3373829) - continued									
EP2012739-001	0082_MW144_S_201117	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	0082_MW144_S_201117	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: 3375140)									
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	0082_QC103_201117	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%
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	0082_QC103_201117	EP002: Dissolved Organic Carbon	----	1	mg/L	1	2	62.3	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: 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
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: 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
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-210-00 1	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
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3379028)								

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: 3379028) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	102	73.2	116
				<1	100 mg/L	102	73.2	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
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**

				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	0082_QC103_201117	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	103	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3373830)							
EP2012739-001	0082_MW144_S_201117	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

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012739**	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/HEHB	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 9
Order number	: DEF19009/0082	No. of samples analysed	: 9

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_MW144_S_201117,	0082_QC103_201117,	----	----	----	27-Nov-2020	17-Nov-2020	**10**
0082_MW310_201117,	0082_MW142_201117,						
0082_MW311_201117,	0082_MW143_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	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
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	17-Nov-2020	×
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_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)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	01-Dec-2020	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	24-Nov-2020	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**----**	----	----	**23-Nov-2020**	15-Dec-2020	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0082_MW144_S_201117,	0082_QC103_201117,	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
0082_MW310_201117,	0082_MW142_201117,							
0082_MW311_201117,	0082_MW143_201117,							
0082_QC301_201117,	0082_QC302_201117,							
0082_QC303_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
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW144_S_201117, 0082_QC103_201117, 0082_MW310_201117, 0082_MW142_201117, 0082_MW311_201117, 0082_MW143_201117, 0082_QC301_201117, 0082_QC302_201117, 0082_QC303_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW144_S_201117, 0082_QC103_201117, 0082_MW310_201117, 0082_MW142_201117, 0082_MW311_201117, 0082_MW143_201117, 0082_QC301_201117, 0082_QC302_201117, 0082_QC303_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)							
0082_MW144_S_201117, 0082_QC103_201117, 0082_MW310_201117, 0082_MW142_201117, 0082_MW311_201117, 0082_MW143_201117, 0082_QC301_201117, 0082_QC302_201117, 0082_QC303_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW144_S_201117, 0082_QC103_201117, 0082_MW310_201117, 0082_MW142_201117, 0082_MW311_201117, 0082_MW143_201117, 0082_QC301_201117, 0082_QC302_201117, 0082_QC303_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	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	18	**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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	37	**10.81**	**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	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	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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	37	**10.81**	**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	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	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	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	37	**5.41**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	37	**5.41**	**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	0	18	**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.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2012740**

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	: 16038	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 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	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)
EP2012740-001	17-Nov-2020 10:01	0082_QC102_201117	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012740-001	17-Nov-2020 10:01	0082_QC102_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_QC102_201117	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
EP2012740

Telephone : +61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEP19009 **Client:** CYRONO **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:	**Date / Time:**	**Date / Time:**	**Date / Time:**
18/11/20			19-11-20 1050

CHAIN OF CUSTODY

(ALS) COC#: **16038** *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/HEHB SW AB

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

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	0082_QC102_201117		17/11/2020 10:01 AM	Water	ALS: 4 Non ALS: 0	No	X		

CHAIN OF CUSTODY

COC#: 16038 *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/HEHB SW AB

ORDER NO: DEF19009/0082

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

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_QC102_201117	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056037	Purple	No	
001	0082_QC102_201117	HDPE (no PTFE)	20 mL	00352005016324	Grey	No	
001	0082_QC102_201117	HDPE (no PTFE)	20 mL	00352005016227	Grey	No	
001	0082_QC102_201117	Clear Plastic Bottle - Natural	250 mL	00070719042909	Green	No	

Total Bottle Count: ALS: 4, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2012740**	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	: 16038	Issue Date	: 30-Nov-2020 17:43
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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*
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	0082_QC102_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 10:01	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012740-001	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.98	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		118000	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		51	----	----	----	----
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		162	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		162	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		8020	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		57800	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		1410	----	----	----	----
Magnesium	7439-95-4	1	mg/L		4720	----	----	----	----
Sodium	7440-23-5	1	mg/L		36800	----	----	----	----
Potassium	7440-09-7	1	mg/L		2220	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		1800	----	----	----	----
ø Total Cations	----	0.01	meq/L		2120	----	----	----	----
ø Ionic Balance	----	0.01	%		8.06	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		16	----	----	----	----
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	0082_QC102_201117	----	----	----	----
			Sampling date / time		17-Nov-2020 10:01	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012740-001	--------	--------	--------	--------
					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	0082_QC102_201117	----	----	----	----
				Sampling date / time	17-Nov-2020 10:01	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012740-001	--------	--------	--------	--------
					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		<0.05	----	----	----	----
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	%		**119**	----	----	----	----

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	: **EP2012740**	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	: DEF19009/0082	Date Analysis Commenced	: 20-Nov-2020
C-O-C number	: 16038	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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 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: 3388156)									
EP2012740-001	0082_QC102_201117	EA005-P: pH Value	----	0.01	pH Unit	7.98	7.98	0.00	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	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	328	291	11.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3388155)									
EP2012740-001	0082_QC102_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	162	164	1.07	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	162	164	1.07	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: 3375140)									
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%

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									
EP2012739-002	Anonymous	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%
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

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: 3388156)								
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: 3388155)								
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	105	81.2	126
				<1	200 mg/L	96.2	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
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
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

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: 3382762) - continued								
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
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	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: 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

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2012740**	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	: 19-Nov-2020
Site	: DEF19009/HEHB	Issue Date	: 30-Nov-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 1
Order number	: DEF19009/0082	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

- **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_QC102_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	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
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0082_QC102_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_QC102_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_QC102_201117	**17-Nov-2020**	**----**	----	----	**24-Nov-2020**	24-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_QC102_201117	**17-Nov-2020**	**----**	----	----	**27-Nov-2020**	01-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_QC102_201117	**17-Nov-2020**	**----**	----	----	**26-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
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_QC102_201117	**17-Nov-2020**	**----**	----	----	**26-Nov-2020**	15-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_QC102_201117	**17-Nov-2020**	**----**	----	----	**20-Nov-2020**	24-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_QC102_201117	**17-Nov-2020**	**----**	----	----	**23-Nov-2020**	15-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_QC102_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_QC102_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_QC102_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)							
0082_QC102_201117	**17-Nov-2020**	**26-Nov-2020**	16-May-2021	✓	**26-Nov-2020**	16-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_QC102_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	1	1	**100.00**	**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	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	1	4	**25.00**	**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
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	1	**200.00**	**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	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	4	**50.00**	**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
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	1	**100.00**	**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	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	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
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	0	18	**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.

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.

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Monitoring Date	Location ID	Sample_ID	Screen Interval (bgl) (multi-level bores)	Bore Depth (m)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)	Other Observations on Bore/Site	Purge Method
16/11/2020	MW022							Bore Locked	
17/11/2020	MW103D	0082_MW103D_201117		14.179	8.948	9.3778	0.4298		HydroSleeve
17/11/2020	MW105S			4.449				Dry	HydroSleeve
17/11/2020	MW109	0082_MW109_201117		9.138	5.307	5.627	0.32		HydroSleeve
17/11/2020	MW113	0082_MW113_201117		8.739	6.243	6.6842	0.4412		HydroSleeve
17/11/2020	MW115	0082_MW115_201117		8.621	7.258	7.7258	0.4678		HydroSleeve
16/11/2020	MW118D	0082_MW118D_201116		10.927	5.124	6.2622	1.1382		HydroSleeve
16/11/2020	MW122	0082_MW122_201116		8.64	4.781	5.0782	0.2972		HydroSleeve
17/11/2020	MW126							Access restricted for Asbestos removal works	
16/11/2020	MW128	0082_MW128_201116	3.7-4.2	3.62	2.51	2.5435	0.0335		HydroSleeve
16/11/2020	MW129	0082_MW129_201116	3.5-4.0	4	2.34	2.5311	0.1911		HydroSleeve
16/11/2020	MW130	0082_MW130_201116	4.9-5.4	6.21	3.355	2.4364	-0.9186		HydroSleeve
16/11/2020	MW131	0082_MW131_201116	4.0-4.5	5	2.69	2.8774	0.1874		HydroSleeve
16/11/2020	MW132	0082_MW132_201116	4.4-4.9	5.92	5.22	5.4103	0.1903		HandBailing
16/11/2020	MW133	0082_MW133_201116	3.0-3.5	3.5	2.05	2.1505	0.1005		HydroSleeve
17/11/2020	MW134	0082_MW134_201117	8.6-9.1	9.4	6.345	6.5343	0.1893		HydroSleeve
17/11/2020	MW135	0082_MW135_201117	8.3-8.8	9.32	8.99	9.2988	0.3088		HydroSleeve
16/11/2020	MW137	0082_MW137_6.0_201116	6.1-6.6	6	5.209	5.3984	0.1894		HydroSleeve
17/11/2020	MW142	0082_MW142_201117			7.04	7.5281	0.4881		HydroSleeve
17/11/2020	MW143	0082_MW143_201117			10.07	10.5204	0.4504		HydroSleeve
17/11/2020	MW144S	0082_MW144S_201117		8.84	5.82	6.0715	0.2515		HydroSleeve
17/11/2020	MW145	0082_MW145_201117		6.905	3.244	3.8644	0.6204		HydroSleeve
17/11/2020	MW147	0082_MW147_201117		7.735	5.238	5.51	0.272		HydroSleeve
17/11/2020	MW148S	0082_MW148S_201117		8.15	5.585	5.7648	0.1798		HydroSleeve
16/11/2020	MW151S	0082_MW151S_201116		5	3.27	3.4	0.13		HydroSleeve
16/11/2020	MW152S	0082_MW152S_201116		6.368	3.253	3.4103	0.1573		HydroSleeve
16/11/2020	MW153S	0082_MW153S_201116		6.289	4.617	4.7872	0.1702		HydroSleeve
16/11/2020	MW154S	0082_MW154S_201116		6.562	3.61	3.8177	0.2077		HydroSleeve
16/11/2020	MW155S	0082_MW155S_201116		7.765	4.813	5.0072	0.1942		HydroSleeve
17/11/2020	MW310	0082_MW310_201117			5.04	5.401	0.361		HydroSleeve
17/11/2020	MW311	0082_MW311_201117			3.84	4.205	0.365		HydroSleeve
17/11/2020	MW315	0082_MW315_201117		8.2	7.59	8.018	0.428		HydroSleeve
17/11/2020	MW326	0082_MW326_201117		4.624	2.437	2.611	0.174		HydroSleeve
16/11/2020	OTH101	0082_OTH101_201116			0.3				Direct into bottle
16/11/2020	OTH102	0082_OTH102_201116			0.3				Direct into bottle
16/11/2020	OTH103	0082_OTH103_201116			0.2				Direct into bottle
16/11/2020	OTH104	0082_OTH104_201116			0.3				Direct into bottle
16/11/2020	OTH105	0082_OTH105_201116			0.2				Direct into bottle
16/11/2020	OTH106	0082_OTH106_201116			0.3				Direct into bottle

Monitoring Date	Location ID	Temp (Co)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	QC Dup Sample #	Odour ?	Odour Comments	colour
16/11/2020	MW022										
17/11/2020	MW103D	30.3	1.44	6656	3932.5	-7.01	-82.6		no		Brown,Cloudy
17/11/2020	MW105S										
17/11/2020	MW109	28.9	1.11	12191	7384	7.25	-34.5		no		Cloudy,Brown
17/11/2020	MW113	26.9	2.9	3795	2405	7.41	-7.6	QC106/206	no		Cloudy,Brown
17/11/2020	MW115	29.2	0.59	5906	3562	7.01	-89.7		no		Cloudy,Black
16/11/2020	MW118D	30.2	2.48	4778	3308.5	7.58	-111		no		Cloudy,Brown
16/11/2020	MW122	29.5	1.33	9602	5746	7.33	-148.5		no		Brown,Cloudy
17/11/2020	MW126										
16/11/2020	MW128	30.4	1.99	66778	39325	7.25	72.4		yes	Dirt smell	Brown,Cloudy
16/11/2020	MW129	31.9	1.77	55082		5.97	164				
16/11/2020	MW130	30.5	1.71	52796		6.95	174.1				
16/11/2020	MW131	31	1.88	47306		7.12	22.2				
16/11/2020	MW132	28.7	2.1	55228	33605	4.2	237.2		no		Clear,Cloudy
16/11/2020	MW133	30.2	1.54	53972		7.36	199.7				
17/11/2020	MW134	29.6	2.63	49581	29607.5	6.95	27.6	QC105, QC205	no		Brown,Cloudy
17/11/2020	MW135	30.6	1.05	28725	16874	7.77	-86.2		yes	Dirt	Brown,Cloudy
16/11/2020	MW137	31	1.35	23570	13747.5	7.04	-204.1		no		Brown,Black,Cloudy
17/11/2020	MW142	29.5	0.88	3115		7.14	211.6				
17/11/2020	MW143	31	1.34	1562		8.28	175.7				
17/11/2020	MW144S	28.4	0.46	5262		7.74	169.8	Qc103 /203	no		Cloudy
17/11/2020	MW145	28.1	1.96	54683	33605	6.82	74.4		no		Cloudy,Brown
17/11/2020	MW147	28.6	1.59	40108	24381.5	5.73	5		yes	Slight hydrocarbon smell	Clear,Green
17/11/2020	MW148S	30.2	1.98	50867	30095	7.8	14.7		no		Cloudy,Brown
16/11/2020	MW151S	30	0.36	55266		7.14	76.7				
16/11/2020	MW152S	29.2	1.66	55686	33540	7.09	-33.3		no		Brown,Cloudy
16/11/2020	MW153S	28.9	1.44	50566	30485	6.61	1.1		no		Brown,Cloudy
16/11/2020	MW154S	30.7	1.98	25439	14904.5	6.72	46.1		no		Cloudy,Brown
16/11/2020	MW155S	30.3	1.07	28076	16601	6.56	-11		no		Cloudy,Brown
17/11/2020	MW310	31.3	2.23	3172		7.64	178.8				
17/11/2020	MW311	30.4	2.49	1360		7.77	183.4				
17/11/2020	MW315	30.4	6.73	2843	1670.5	9	24.7		no		Clear,Brown
17/11/2020	MW326	29.3	0.49	44266	26630	6.82	-107.2	QC104/204	no		Cloudy,Brown
16/11/2020	OTH101	28.2	3.97	65166	39910.18	5.4	214.2		no		Clear
16/11/2020	OTH102	29.1	4.08	65705	39650	5.12	224.8		no		Clear,Cloudy
16/11/2020	OTH103	27.3	4.08	62149	38675	6.48	164.8		no		Clear
16/11/2020	OTH104	26	4.15	63120	40170	4.42	246.3		no		Clear,Cloudy
16/11/2020	OTH105	26.4	3.91	62714	39650	8.91	-7.6		no		Clear
16/11/2020	OTH106	26.3	3.99	62445	39585	7.44	81.3		no		Clear

Location ID	Date	Sample ID	Sample Type	Sampling Method	Sample Depth (m)	WaterBody Depth (m)	Location	Flow Rate	Comments	Temp C	DO (mg/L)	EC (us/Cm)	pH	Eh (mV)	Colour	Turbidity
SS167	16/11/2020	0082_SS167_201116	Sediment	Shovel Trowel	0.1											
SS169	16/11/2020	0082_SS169_201116	Sediment	Shovel Trowel	0.1											
SD164	16/11/2020	0082_SD164_201116	Sediment	Shovel Trowel	0.1											
SS165	16/11/2020	0082_SS165_201116	Sediment	Shovel Trowel	0.1											
SD181	16/11/2020	0082_SD181_201116	Sediment	Direct into Bottle												
SD161	16/11/2020	0082_SD161_201116	Sediment	Direct into Bottle	0.1				Creek bed dry							
SD162	16/11/2020	0082_SD162_201116	Sediment	Direct into Bottle	0.1				Creek bed dry							
SS179	16/11/2020	0082_SS179_201116	Sediment	Direct into Bottle	0											
SS173	16/11/2020	0082_SS173_201116	Sediment	Direct into Bottle												
SS171	16/11/2020	0082_SS171_201116	Sediment	Direct into Bottle												
SD163	16/11/2020	0082_SD163_201116	Sediment	Direct into Bottle	0.1				QC101, QC201							
SW164	16/11/2020		Surface Water	Direct into Bottle					Dry							
SW165	16/11/2020		Surface Water	Direct into Bottle					Dry							
SW181	16/11/2020	0082_SW181_201116	Surface Water	Direct into Bottle	0.1	0.5	Offsite	Slow	qc102/202	30.6	1.94	145060	8.51	121	brown	Medium
SW161	16/11/2020		Surface Water	Direct into Bottle					DRY							
SW162	16/11/2020		Surface Water	Direct into Bottle					DRY							
SW163	16/11/2020		Surface Water	Direct into Bottle					DRY							

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

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

ECO Environmental

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& sampling equipment
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www.ecoenvironmental.com.au
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

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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 16 and 17 November 2020 and is in accordance with the proposed scope of work, as documented in the SAQP (DEF19009_ Harold E Holt Area B_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 10 days overdue 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. **Sediment:** No holding time exceedances were reported for the sediment samples.
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>5 for 37 primary water samples (13.5%)
1 for 11 primary sediment samples (9.1%)</td></tr>
<tr><td>Split duplicate</td><td>1 in 10 primary water samples (10%)
1 in 20 primary sediment samples (5%)</td><td>5 for 37 primary water samples (13.5%)
1 for 11 primary sediment samples (9.1%)</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 analysed: 37
▪ Duplicate Samples Analysed: 5
▪ Percentage of RPDs above criteria: 2.1%
Sediment
▪ Number of Primary samples analysed: 11
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs above criteria: 2.5%
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 analysed: 37
▪ Duplicate Samples Analysed: 5
▪ Percentage of RPDs above criteria: 18.7%
Sediment
▪ Number of primary samples analysed: 11
▪ 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: • EP2012669 o Sulfate as SO4-. Client Sample ID: MW154S. MS recovery not determined, background level greater than or equal to 4x spike level. o Chloride. Client Sample ID: MW154S. MS recovery not determined, background level greater than or equal to 4x spike level. • EP2012737 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. • EP2012670, EP2012672, EP2012738 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. Quality Control sample frequency was generally within the expected rate with the exception of the following: • EP2012670, EP2012672, EP2012737, EP2012748 o PFAS. Duplicate sample frequency Actual rate < Expected rate (10%). • EP2012669, EP2012738, EP2012739, EP2012740 o PFAS. 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 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.

QA/QC Aspects	Evidence & Evaluation
	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 B

Prepared for

Department of Defence

24 May 2021

Cardno

Contact Information

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Document Information

Prepared for	Department of Defence
Project Name	PFAS OMP First Flush Sampling Event Factual Report
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Job Reference	DEF19009
Date	24 May 2021
Version Number	Rev 2

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
0.0	10/04/2021	Internal Draft	MB	DJ
Rev 0	12/04/2021	Client Submission / Review	MB	DJ
Rev 1	30/04/2021	Revised	JS	MB
Rev 2	25/05/2021	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 B ("HEH-B" 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 B'.

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 B.

> "the Management Area" was defined as comprising the Site, plus the land extending to the Exmouth Gulf (to the east and north-east) (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
Off-Site - Pathway 2	0082_SW164, 0082_SW181, 0082_SS165, 0082_SS167, 0082_SS169, 0082_SS171, 0082_SS173, 0082_SS179
Off-Site - Receptor B	0082_SW161, 0082_SW162, 0082_SW163

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
Off-Site - Pathway 2	0082_SD164, 0082_SD181, 0082_SS165, 0082_SS167, 0082_SS169, 0082_SS171, 0082_SS173, 0082_SS179
Off-Site - Receptor B	0082_SD161, 0082_SD162, 0082_SD163

[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
SW164, SS165, SS167, SS169, SS171, SS173, SS179	Not sampled for surface water	These locations were 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.

Activity	Details
	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	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, 2019), 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 (roadside and natural drainage channels) around site and within the blackwater lagoon northeast of the Base following the recent heavy rainfall event. It is understood that the lagoon discharges to the Exmouth Gulf.

Some surface water monitoring locations within the main drainage channel from the site were found dry.

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 considered 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 and 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. 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]	<0.01	4	0
PFOS	-	0.00023[3]	<0.01	4	0
Sum of PFHxS and PFOS	-	2[2]	<0.01	4	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 of PFOA or Sum of PFOS and PFHxS above the laboratory LOR or new exceedances of the relevant assessment criteria at any of the surface water monitoring locations.
- All surface water samples reported PFAS concentrations below the laboratory 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 with no first time detections of Sum of PFOS and PFHxS or PFOA; and no new exceedances 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]	<0.0002	11	0
PFOS	-	0.01[3]	0.0099	11	0
Sum of PFHxS and PFOS	-	20[4]	0.0106	11	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:

- There were no first-time detects above the laboratory LOR or 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.

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-B as part of the PFAS OMP following the first heavy rainfall of the wet season. Surface water sampling and testing was undertaken at four (4) monitoring locations and sediment sampling and testing at eleven (11) locations. Seven (7) surface water monitoring locations within the main drainage channel from the site were found dry and could not be sampled.

The surface water laboratory results reported the following:

- All four samples tested reported 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 eleven samples that were tested, there were no exceedances of the relevant assessment criteria for any of the sediment samples.
- There were no first-time detects above the laboratory LOR or new exceedances 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-B 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 Defence, 2017, Defence Contamination Management Manual (DCMM).
7. Defence PFAS Investigation and Management Branch, 2020, '*Guidance for the preparation of PFAS OMP Factual Reports'*.
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.
9. Department of Environment Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*.
10. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (https://maps.water.wa.gov.au/#/webmap/gwm).
11. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, '*Guidance on Environmental Data Verification and Data Validation'.*
12. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
13. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
14. National Health and Medical Research Council (NHMRC) (2011, as updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
15. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
16. 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'*.
17. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
18. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

Site Specific References

19. Cardno, June 2020, Reference: DEF19009, '*PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Naval Communication Station Harold Holt B'*.
20. Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter.
21. Cardno, May 2020, PFAS OMP First Flush Factual Report, HEH-B.
22. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report 2020 Post-summer.
23. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report 2020 Post-winter.
24. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Management Area Plan'.
25. Department of Defence, May 2019, Naval Communication Station Harold E Holt – Area B 'PFAS Ongoing Monitoring Plan'
26. GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area B PFAS Investigations Detailed Site Investigation Report'.
27. GHD Pty Ltd, May 2019, reference: 3135526, 'Harold E Holt B Ecological Risk Assessment'.

APPENDIX A

FIGURES

FIGURE 1

1:100,000 Scale at A3

Meters

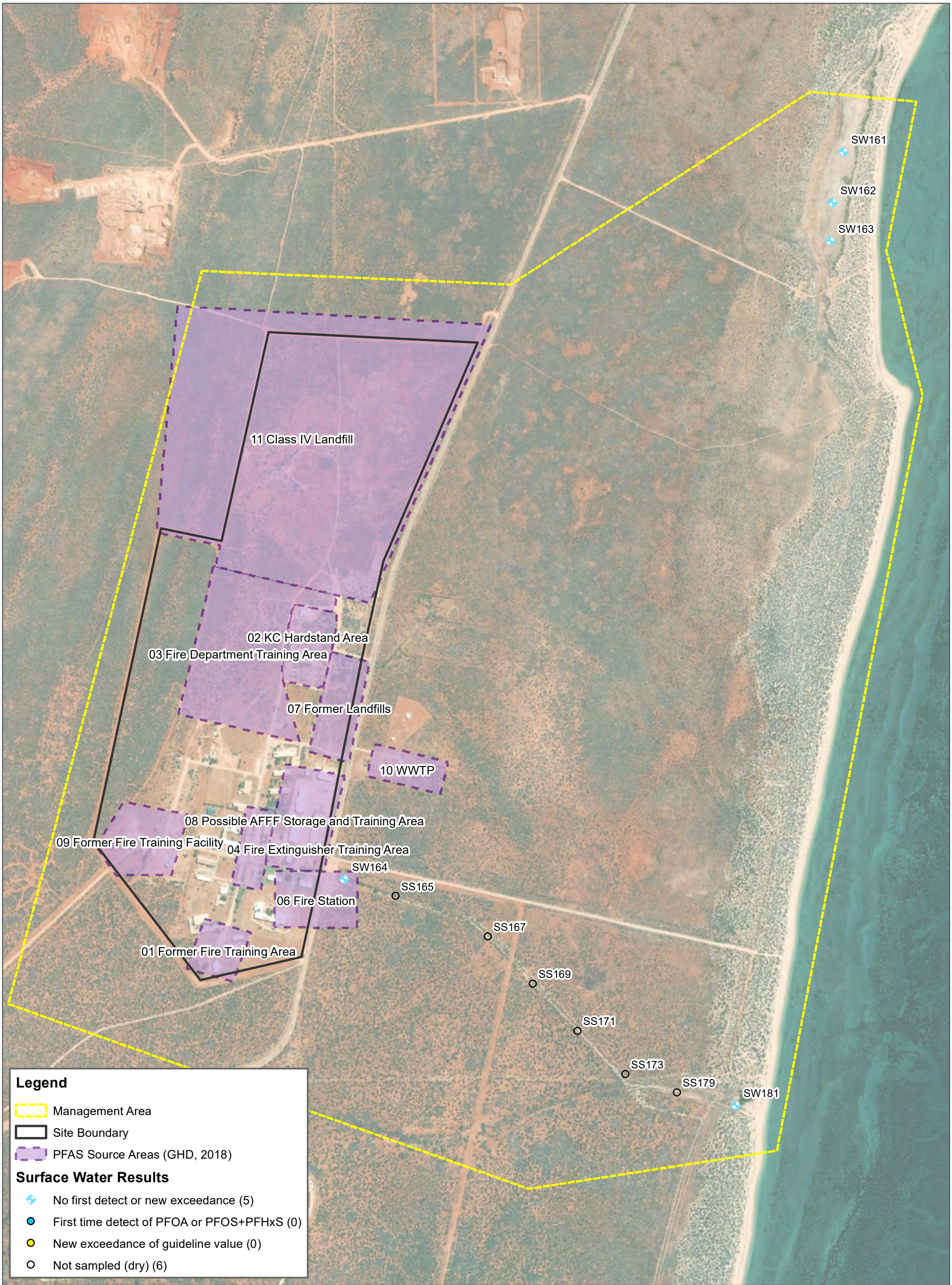
0 1,500 3,000

Site Location

FIRST FLUSH SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth


SW161
SW162
SW163
11 Class IV Landfill
02 KC Hardstand Area
03 Fire Department Training Area
07 Former Landfills
10 WWTP
08 Possible AFFF Storage and Training Area
09 Former Fire Training Facility
04 Fire Extinguisher Training Area
SW164
SS165
06 Fire Station
SS167
01 Former Fire Training Area
SS169
SS171
SS173
SS179
SW181
Legend
Management Area
Site Boundary
PFAS Source Areas (GHD, 2018)
Surface Water Results
No first detect or new exceedance (5)
First time detect of PFOA or PFOS+PFHxS (0)
New exceedance of guideline value (0)
Not sampled (dry) (6)
FIGURE 2
1:11,500 Scale at A3
Meters
0
250
500
Surface Water Monitoring Locations & Results
FIRST FLUSH SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-017_Mar2021SWResults 01.mxd
Aerial Imagery Supplied by Google Earth

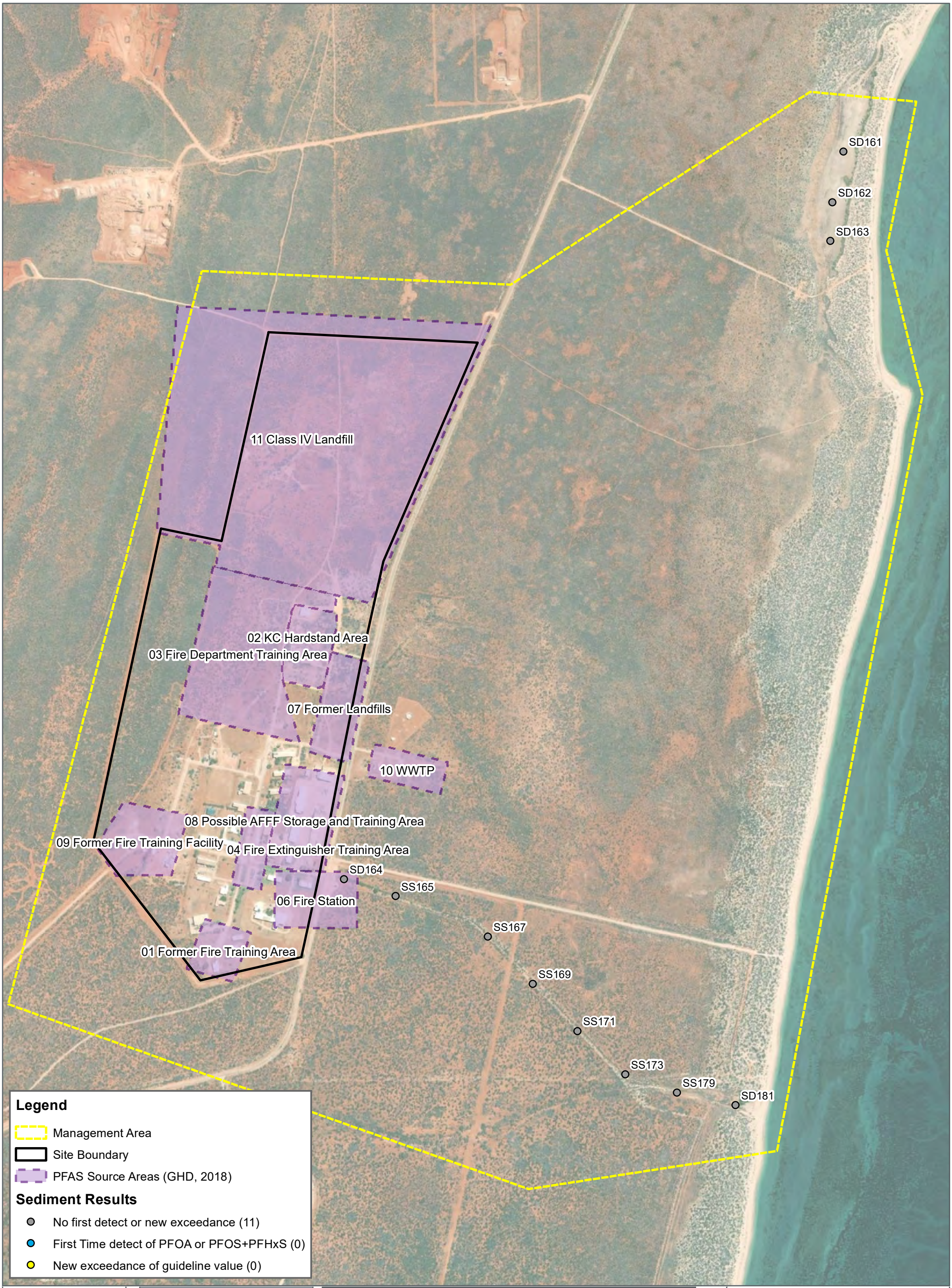


FIGURE 3

1:11,500 Scale at A3

Meters

0 250 500

Sediment Monitoring Locations & Results

FIRST FLUSH SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-003_Mar2021SDResults 01.mxd
Aerial Imagery Supplied by Google Earth

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**															
0082_SW161_210303	**SW161**	**EP2102193**	**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
0082_SW162_210303	**SW162**	**EP2102193**	**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
0082_SW163_210303	**SW163**	**EP2102193**	**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
0082_SW181_210303	**SW181**	**EP2102193**	**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**														
0082_SW161_210303	**SW161**	**EP2102193**	**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	78	<1
0082_SW162_210303	**SW162**	**EP2102193**	**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	125	<1
0082_SW163_210303	**SW163**	**EP2102193**	**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	132	<1
0082_SW181_210303	**SW181**	**EP2102193**	**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	103	<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**														
0082_SW161_210303	**SW161**	**EP2102193**	**3/03/2021**	78	461	500	14,400	4.07	7.55	8,580	2,560	26,900	15	647	1,010	452	14
0082_SW162_210303	**SW162**	**EP2102193**	**3/03/2021**	125	630	701	19,800	5.32	7.66	12,000	3,330	39,200	21	719	1,530	680	14
0082_SW163_210303	**SW163**	**EP2102193**	**3/03/2021**	132	625	731	19,600	7.84	7.59	12,500	3,320	38,200	67	763	1,590	718	18
0082_SW181_210303	**SW181**	**EP2102193**	**3/03/2021**	103	789	939	25,000	8.67	8.02	16,300	3,930	51,000	<5	737	2,040	986	12

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**																			
0082_SD161_210303	**SS161**	**EP2102200**	**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
0082_SD162_210303	**SS162**	**EP2102200**	**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
0082_SD163_210303	**SS163**	**EP2102200**	**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
0082_SD164_210303	**SS164**	**EP2102200**	**3/03/2021**	<0.0002	<0.0002	0.0007	<0.0002	0.0099	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0005	0.0002	0.0003	<0.0005	0.0010	0.0015	<0.0005	<0.0005
0082_SS165_210303	**SS165**	**EP2102192**	**3/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.001	<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	<0.0005
0082_SD167_210303	**SS167**	**EP2102200**	**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	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
0082_SD169_210303	**SS169**	**EP2102200**	**3/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.001	<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	<0.0005
0082_SS171_210303	**SS171**	**EP2102200**	**3/03/2021**	<0.0002	<0.0002	<0.0002	<0.0002	0.0026	<0.0002	<0.001	<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	<0.0005
0082_SS173_210303	**SS173**	**EP2102200**	**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	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
0082_SS179_210303	**SS179**	**EP2102192**	**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	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
0082_SD181_210303	**SS181**	**EP2102192**	**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	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Notes:

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**																	
0082_SD161_210303	**SS161**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.1	32.0	22.5	5.5	0.4	0.3	28.7	8,760	8.7	1.9
0082_SD162_210303	**SS162**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.2	25.4	22.7	7.1	0.3	0.4	30.5	11,100	8.7	1.2
0082_SD163_210303	**SS163**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.4	32.7	29.1	10.6	0.5	1.0	41.2	9,910	8.7	3.0
0082_SD164_210303	**SS164**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0131	0.0106	0.0140	0.5	16.2	17.6	1.5	0.2	0.1	19.4	79	8.6	4.2
0082_SS165_210303	**SS165**	**EP2102192**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0012	0.0012	0.0012	0.7	8.3	9.0	0.9	0.5	<0.1	10.4	66	8.5	1.9
0082_SD167_210303	**SS167**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	3.2	8.8	1.9	0.4	0.2	<0.1	2.6	24	8.4	<0.5
0082_SD169_210303	**SS169**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0004	0.0004	0.0004	1.2	4.6	3.7	0.3	0.1	<0.1	4.2	41	9.1	<0.5
0082_SS171_210303	**SS171**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0026	0.0026	0.0026	1.6	7.7	3.1	0.6	0.3	<0.1	4.1	37	8.6	0.9
0082_SS173_210303	**SS173**	**EP2102200**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.5	7.8	12.8	0.8	0.6	<0.1	14.2	71	8.9	1.0
0082_SS179_210303	**SS179**	**EP2102192**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.0	5.4	3.8	0.9	0.2	<0.1	5.0	64	9.4	0.8
0082_SD181_210303	**SS181**	**EP2102192**	**3/03/2021**	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.6	21.0	17.9	3.4	<0.1	0.1	21.5	1,350	9.0	1.3

Notes:

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
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
Field ID	**Sample Type**	**Lab Report Number**	**Date**																	
0082_QC301_210303	**Rinsate**	**EP2102193**	**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
0082_QC401_210303	**Field Blank**	**EP2102193**	**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
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
Field ID	**Sample Type**	**Lab Report Number**	**Date**														
0082_QC301_210303	**Rinsate**	**EP2102193**	**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
0082_QC401_210303	**Field Blank**	**EP2102193**	**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

	Lab Report Number	EP2102193	EP2102193		EP2102193	779272		
	Field ID	0082_SW181_210303	0082_QC101_210303		0082_SW181_210303	0082_QC201_210303		
	Date	3/03/2021	3/03/2021		3/03/2021	3/03/2021		
	Matrix Type	Water	Water	RPD	Water	Water	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	0.31	188
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	0.31	188
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	-	-	-	0.31	-
Sum of PFAS (PFOS + PFOA)	µg/L	0.01	-	-	-	-	0.25	-
Inorganics								
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	-	-
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	103	107	4	103	-	-
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	-	-
Alkalinity (total) as CaCO3	mg/L	1	103	107	4	103	-	-
Anions Total	meq/L	0.01	789	813	3	789	-	-
Cations Total	meq/L	0.01	939	923	2	939	-	-
Chloride	mg/L	1	25,000	25,800	3	25,000	-	-
Ionic Balance	%	0.01	8.67	6.31	**32**	8.67	-	-
pH (Lab)	pH Units	0.01	8.02	8.17	2	8.02	8.2	2
Sodium (filtered)	mg/L	1	16,300	16,000	2	16,300	-	-
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	3,930	4,000	2	3,930	-	-
TDS	mg/L	10	51,000	50,100	2	51,000	55,000	8
Total Suspended Solids	mg/L	1	<5	6	18	<5	28	**139**
Metals								
Calcium (filtered)	mg/L	1	737	731	1	737	-	-
Magnesium (filtered)	mg/L	1	2,040	2,010	1	2,040	-	-
Potassium (filtered)	mg/L	1	986	975	1	986	-	-
Organic								
Dissolved Organic Carbon	mg/L	1	12	12	0	12	-	-
Dissolved Organic Carbon (filtered)	mg/L	1	-	-	-	-	11	-

*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

			Lab Report Number	EP2102200	EP2102200		EP2102200	779272	
			Field ID	0082_SD164_210303	0082_QC102_210303		0082_SD164_210303	0082_QC202_210303	
			Date	3/03/2021	3/03/2021		3/03/2021	3/03/2021	
			Matrix Type	Soil	Soil	RPD	Soil	Soil	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		0.0007	0.0005	33	0.0007	<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		0.0099	0.0060	**49**	0.0099	<0.005	**66**
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		0.0004	0.0002	67	0.0004	<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		0.0003	0.0003	0	0.0003	<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		0.0010	0.0006	50	0.0010	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005		0.0015	0.0012	22	0.0015	<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		0.0131	0.0083	**45**	0.0131	<0.01	**27**
Sum of PFHxS and PFOS	mg/kg	0.0002		0.0106	0.0065	**48**	0.0106	<0.005	**72**
Sum of PFAS	mg/kg	0.0002		0.0140	0.0090	**43**	0.0140	<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		-	-	-	-	96	-
Exchangeable Sodium Percent	%	0.1		0.5	0.4	22	0.5	-	-
pH (1:5 Aqueous extract at 25Â°C as rec.)	pH Units	0.1		-	-	-	-	7.4	-
Moisture Content	%	0.1		16.2	19.5	18	16.2	17	5
Exchangeable Calcium	meq/100g	0.1		17.6	18.5	5	17.6	-	-
Exchangeable Magnesium	meq/100g	0.1		1.5	1.7	12	1.5	-	-
Exchangeable Potassium	meq/100g	0.1		0.2	0.2	0	0.2	-	-
Exchangeable Sodium	meq/100g	0.1		0.1	<0.1	0	0.1	-	-
CEC	meq/100g	0.05		19.4	20.5	6	19.4	31	**46**
Electrical conductivity *(lab)	µS/cm	1		79	87	10	79	-	-
pH (Lab)	pH Units	0.1		8.6	8.4	2	8.6	-	-
TOC	mg/kg	1,000		-	-	-	-	46,000	-
Organic									
Organic Matter	%	0.5		4.2	4.2	0	4.2	-	-

*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#: 19805 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHB SED

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: 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:	EG 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	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_SS165		03/03/2021 03:18 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0082_SD181		03/03/2021 03:29 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0082_SS179		03/03/2021 03:52 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2102192

Telephone : - 61-8-9406 1301

CHAIN OF CUSTODY

(ALS) COC#: **19805** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHB SED

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: 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_SS165	HDPE Soil Jar	200 mL	00620719008724	Grey	No	
001	0082_SS165	Soil Glass Jar - Unpreserved	150 mL	00260220013249	Orange	No	
002	0082_SD181	Soil Glass Jar - Unpreserved	150 mL	00260220013148	Orange	No	
002	0082_SD181	HDPE Soil Jar	200 mL	00620719008750	Grey	No	
003	0082_SS179	Soil Glass Jar - Unpreserved	150 mL	00260220013152	Orange	No	
003	0082_SS179	HDPE Soil Jar	200 mL	00620719026337	Grey	No	

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

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102192**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 19805	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 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)
EP2102192-001	03-Mar-2021 15:18	0082_SS165_210303	✓	✓	✓	✓
EP2102192-002	03-Mar-2021 15:29	0082_SD181_210303	✓	✓	✓	✓
EP2102192-003	03-Mar-2021 15:52	0082_SS179_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	: **EP2102192**	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	: DEF19009/0082	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19805	Issue Date	: 15-Mar-2021 15:53
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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	0082_SS165_210303	0082_SD181_210303	0082_SS179_210303	----	----
			Sampling date / time	03-Mar-2021 15:18	03-Mar-2021 15:29	03-Mar-2021 15:52	----	----
Compound	CAS Number	LOR	Unit	EP2102192-001	EP2102192-002	EP2102192-003	--------	--------
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.5**	**9.0**	**9.4**	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**66**	**1350**	**64**	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**8.3**	**21.0**	**5.4**	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**9.0**	----	**3.8**	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**0.9**	----	**0.9**	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.5**	----	**0.2**	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	----	<0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**10.4**	----	**5.0**	----	----
Exchangeable Sodium Percent	----	0.1	%	**0.7**	----	**2.0**	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	**17.9**	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	**3.4**	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	**0.1**	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	**21.5**	----	----	----
Exchangeable Sodium Percent	----	0.1	%	----	**0.6**	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**1.9**	**1.3**	**0.8**	----	----
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	**0.0012**	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SS165_210303	0082_SD181_210303	0082_SS179_210303	----	----
				Sampling date / time	03-Mar-2021 15:18	03-Mar-2021 15:29	03-Mar-2021 15:52	----	----
Compound	CAS Number	LOR	Unit		EP2102192-001	EP2102192-002	EP2102192-003	--------	--------
					Result	Result	Result	----	----
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	----	----
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	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SS165_210303	0082_SD181_210303	0082_SS179_210303	----	----
				Sampling date / time	03-Mar-2021 15:18	03-Mar-2021 15:29	03-Mar-2021 15:52	----	----
Compound	CAS Number	LOR	Unit		EP2102192-001	EP2102192-002	EP2102192-003	--------	--------
					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		<0.0005	<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		**0.0012**	<0.0002	<0.0002	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0012**	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0012**	<0.0002	<0.0002	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**102**	**104**	**100**	----	----
13C8-PFOA	----	0.0002	%		**94.5**	**94.5**	**93.5**	----	----

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	: **EP2102192**	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	: DEF19009/0082	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19805	Issue Date	: 15-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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	0082_SS165_210303	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	0082_SS165_210303	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	0082_SS165_210303	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%
ED007: Exchangeable Cations (QC Lot: 3554864)									
EP2102192-001	0082_SS165_210303	ED007: Exchangeable Sodium Percent	----	0.1	%	0.7	0.8	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	9.0	7.5	17.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.5	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	10.4	8.9	16.0	0% - 20%
EP2102259-002	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	20.0	20.1	0.608	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.4	4.94	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	23.5	23.5	0.00	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3553755)									
EP2102192-002	0082_SD181_210303	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%

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	0082_SD181_210303	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	0082_SS165_210303	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: 3556278)									
EP2102192-001	0082_SS165_210303	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	0082_SS165_210303	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

Sub-Matrix: **SOIL**

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: 3556278) - continued									
EP2102200-008	Anonymous	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	0082_SS165_210303	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
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	0082_SS165_210303	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

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: 3556278) - continued									
EP2102192-001	0082_SS165_210303	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
ED007: Exchangeable Cations (QCLot: 3554864)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	93.5	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	95.5	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	112	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	94.8	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: 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

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: 3556278) - continued								
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)								
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	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556278)							
EP2102192-001	0082_SS165_210303	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

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)							
EP2102192-001	0082_SS165_210303	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
		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	0082_SS165_210303	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	0082_SS165_210303	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	: **EP2102192**	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/HEHB	Issue Date	: 15-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 3
Order number	: DEF19009/0082	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)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_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)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_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)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	17-Mar-2021	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
0082_SS165_210303, 0082_SS179_210303	**03-Mar-2021**	**11-Mar-2021**	31-Mar-2021	✓	**11-Mar-2021**	31-Mar-2021	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
0082_SD181_210303	**03-Mar-2021**	**11-Mar-2021**	31-Mar-2021	✓	**11-Mar-2021**	31-Mar-2021	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_210303	**03-Mar-2021**	**12-Mar-2021**	31-Mar-2021	✓	**12-Mar-2021**	31-Mar-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_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
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0082_SS165_210303, 0082_SD181_210303, 0082_SS179_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	ED007	2	20	**10.00**	**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	ED007	1	20	**5.00**	**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	ED007	1	20	**5.00**	**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	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

(ALS) COC#: 19833 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHB SW

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: 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	Rinsate WATER	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_SW181		03/03/2021 03:31 PM	Water	ALS: 4 Non ALS: 0	No		X		
002	0082_QC101		03/03/2021 03:32 PM	Water	ALS: 4 Non ALS: 0	No		X		
003	0082_SW163		03/03/2021 04:14 PM	Water	ALS: 4 Non ALS: 0	No		X		
004	0082_SW162		03/03/2021 04:15 PM	Water	ALS: 4 Non ALS: 0	No		X		
005	0082_SW161		03/03/2021 04:16 PM	Water	ALS: 4 Non ALS: 0	No		X		
006	0082_QC401		03/03/2021 06:56 PM	Water	ALS: 1 Non ALS: 1	No	X			
007	0082_QC301		03/03/2021 06:59 PM	Water	ALS: 2 Non ALS: 0	No	X			

Environmental Division
Perth
Work Order Reference
EP2102193

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

(ALS) COC#: 19833 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: AB DEF19009/HEHB SW

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: 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_SW181	Clear Plastic Bottle - Natural	250 mL	00070220155416	Green	No	
001	0082_SW181	HDPE (no PTFE)	20 mL	00350019102529	Grey	No	
001	0082_SW181	HDPE (no PTFE)	20 mL	00350019102637	Grey	No	
001	0082_SW181	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049237	Purple	No	
002	0082_QC101	Clear Plastic Bottle - Natural	250 mL	00070220155444	Green	No	
002	0082_QC101	HDPE (no PTFE)	20 mL	00350019102647	Grey	No	
002	0082_QC101	HDPE (no PTFE)	20 mL	00350019102550	Grey	No	
002	0082_QC101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220048881	Purple	No	
003	0082_SW163	Clear Plastic Bottle - Natural	250 mL	00070220155441	Green	No	
003	0082_SW163	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049289	Purple	No	
003	0082_SW163	HDPE (no PTFE)	20 mL	00350019126761	Grey	No	
003	0082_SW163	HDPE (no PTFE)	20 mL	00350019126785	Grey	No	
004	0082_SW162	Clear Plastic Bottle - Natural	250 mL	00070220154942	Green	No	
004	0082_SW162	HDPE (no PTFE)	20 mL	00350019102609	Grey	No	
004	0082_SW162	HDPE (no PTFE)	20 mL	00350019102461	Grey	No	
004	0082_SW162	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049115	Purple	No	
005	0082_SW161	HDPE (no PTFE)	20 mL	00350019102460	Grey	No	
005	0082_SW161	HDPE (no PTFE)	20 mL	00350019102603	Grey	No	
005	0082_SW161	Clear Plastic Bottle - Natural	250 mL	00070220155445	Green	No	
005	0082_SW161	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049325	Purple	No	
006	0082_QC401	HDPE (no PTFE)	20 mL	00350019026907	Grey	No	
007	0082_QC301	HDPE (no PTFE)	20 mL	00350019041995	Grey	No	
007	0082_QC301	HDPE (no PTFE)	20 mL	00350019041939	Grey	No	

Total Bottle Count: ALS: 23, Non ALS: 1

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102193**

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	: 19833	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 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)
EP2102193-001	03-Mar-2021 15:31	0082_SW181_210303	✓	✓	✓	✓	✓	✓	✓
EP2102193-002	03-Mar-2021 15:32	0082_QC101_210303	✓	✓	✓	✓	✓	✓	✓
EP2102193-003	03-Mar-2021 16:14	0082_SW163_210303	✓	✓	✓	✓	✓	✓	✓
EP2102193-004	03-Mar-2021 16:15	0082_SW162_210303	✓	✓	✓	✓	✓	✓	✓
EP2102193-005	03-Mar-2021 16:16	0082_SW161_210303	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2102193-001	03-Mar-2021 15:31	0082_SW181_210303	✓
EP2102193-002	03-Mar-2021 15:32	0082_QC101_210303	✓
EP2102193-003	03-Mar-2021 16:14	0082_SW163_210303	✓
EP2102193-004	03-Mar-2021 16:15	0082_SW162_210303	✓
EP2102193-005	03-Mar-2021 16:16	0082_SW161_210303	✓
EP2102193-006	03-Mar-2021 18:56	0082_QC401_210303	✓
EP2102193-007	03-Mar-2021 18:59	0082_QC301_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							
0082_QC101_210303	Clear Plastic Bottle - Natural	----	03-Mar-2021	08-Mar-2021	×	----	----
0082_SW161_210303	Clear Plastic Bottle - Natural	----	03-Mar-2021	08-Mar-2021	×	----	----
0082_SW162_210303	Clear Plastic Bottle - Natural	----	03-Mar-2021	08-Mar-2021	×	----	----
0082_SW163_210303	Clear Plastic Bottle - Natural	----	03-Mar-2021	08-Mar-2021	×	----	----
0082_SW181_210303	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	: **EP2102193**	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	: DEF19009/0082	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19833	Issue Date	: 15-Mar-2021 10:28
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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*
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	0082_SW181_210303	0082_QC101_210303	0082_SW163_210303	0082_SW162_210303	0082_SW161_210303
				Sampling date / time	03-Mar-2021 15:31	03-Mar-2021 15:32	03-Mar-2021 16:14	03-Mar-2021 16:15	03-Mar-2021 16:16
Compound	CAS Number	LOR	Unit		EP2102193-001	EP2102193-002	EP2102193-003	EP2102193-004	EP2102193-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.02	8.17	7.59	7.66	7.55
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		51000	50100	38200	39200	26900
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	6	67	21	15
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		103	107	132	125	78
Total Alkalinity as CaCO3	----	1	mg/L		103	107	132	125	78
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		3930	4000	3320	3330	2560
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		25000	25800	19600	19800	14400
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		737	731	763	719	647
Magnesium	7439-95-4	1	mg/L		2040	2010	1590	1530	1010
Sodium	7440-23-5	1	mg/L		16300	16000	12500	12000	8580
Potassium	7440-09-7	1	mg/L		986	975	718	680	452
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		789	813	625	630	461
ø Total Cations	----	0.01	meq/L		939	923	731	701	500
ø Ionic Balance	----	0.01	%		8.67	6.31	7.84	5.32	4.07
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		12	12	18	14	14
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	0082_SW181_210303	0082_QC101_210303	0082_SW163_210303	0082_SW162_210303	0082_SW161_210303
				Sampling date / time	03-Mar-2021 15:31	03-Mar-2021 15:32	03-Mar-2021 16:14	03-Mar-2021 16:15	03-Mar-2021 16:16
Compound	CAS Number	LOR	Unit		EP2102193-001	EP2102193-002	EP2102193-003	EP2102193-004	EP2102193-005
					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	0082_SW181_210303	0082_QC101_210303	0082_SW163_210303	0082_SW162_210303	0082_SW161_210303
				Sampling date / time	03-Mar-2021 15:31	03-Mar-2021 15:32	03-Mar-2021 16:14	03-Mar-2021 16:15	03-Mar-2021 16:16
Compound	CAS Number	LOR	Unit		EP2102193-001	EP2102193-002	EP2102193-003	EP2102193-004	EP2102193-005
					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	%		**83.9**	**86.5**	**87.9**	**97.1**	**80.5**
13C8-PFOA	----	0.02	%		**110**	**106**	**110**	**113**	**109**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC401_210303	0082_QC301_210303	----	----	----
				Sampling date / time	03-Mar-2021 18:56	03-Mar-2021 18:59	----	----	----
Compound	CAS Number	LOR	Unit		EP2102193-006	EP2102193-007	--------	--------	--------
					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	0082_QC401_210303	0082_QC301_210303	----	----	----
				Sampling date / time	03-Mar-2021 18:56	03-Mar-2021 18:59	----	----	----
Compound	CAS Number	LOR	Unit		EP2102193-006	EP2102193-007	--------	--------	--------
					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	%		**88.0**	**92.4**	----	----	----
13C8-PFOA	----	0.02	%		**107**	**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

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	: **EP2102193**	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	: DEF19009/0082	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19833	Issue Date	: 15-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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*
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	0082_QC101_210303	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	0082_SW181_210303	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	0082_SW181_210303	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	0082_QC101_210303	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	0082_SW181_210303	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	0082_SW181_210303	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	0082_SW181_210303	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	0082_SW181_210303	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	0082_SW181_210303	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	0082_SW181_210303	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3552889)							
EP2102193-002	0082_QC101_210303	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	: **EP2102193**	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/HEHB	Issue Date	: 15-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 7
Order number	: DEF19009/0082	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

- **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	0082_SW181_210303	**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	0082_SW181_210303	**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						
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	----	----	----	09-Mar-2021	03-Mar-2021	**6**

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

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_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	03-Mar-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	17-Mar-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**11-Mar-2021**	31-Mar-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**11-Mar-2021**	31-Mar-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	10-Mar-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	31-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
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303, 0082_QC401_210303, 0082_QC301_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303, 0082_QC401_210303, 0082_QC301_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303, 0082_QC401_210303, 0082_QC301_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)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303, 0082_QC401_210303, 0082_QC301_210303	**03-Mar-2021**	**11-Mar-2021**	30-Aug-2021	✓	**12-Mar-2021**	30-Aug-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_SW181_210303, 0082_QC101_210303, 0082_SW163_210303, 0082_SW162_210303, 0082_SW161_210303, 0082_QC401_210303, 0082_QC301_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#: 19808 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB SED - SC

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: 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: 8/3 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	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_SD164		03/03/2021 02:55 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0082_QC102		03/03/2021 02:56 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0082_SD169		03/03/2021 03:27 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0082_SD167		03/03/2021 03:28 PM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0082_SS171		03/03/2021 03:42 PM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0082_SS173		03/03/2021 03:48 PM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0082_SD161		03/03/2021 04:15 PM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0082_SD162		03/03/2021 04:16 PM	Soil	ALS: 2 Non ALS: 0	No	X		
009	0082_SD163		03/03/2021 04:16 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2102200

Telephone : -- 61-8-9406 1301

Wednesday, March 3, 2021 10:32:56 PM

CHAIN OF CUSTODY

(ALS) *COC#:* **19808** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: DEF19009/HEHB SED - SC

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: 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_SD164	HDPE Soil Jar	200 mL	00620719008708	Grey	No	
001	0082_SD164	Soil Glass Jar - Unpreserved	150 mL	00260220013127	Orange	No	
002	0082_QC102	HDPE Soil Jar	200 mL	00620719026363	Grey	No	
002	0082_QC102	Soil Glass Jar - Unpreserved	150 mL	00260220013384	Orange	No	
003	0082_SD169	Soil Glass Jar - Unpreserved	150 mL	00260220013159	Orange	No	
003	0082_SD169	HDPE Soil Jar	200 mL	00620719008740	Grey	No	
004	0082_SD167	HDPE Soil Jar	200 mL	00620719026353	Grey	No	
004	0082_SD167	Soil Glass Jar - Unpreserved	150 mL	00260220013269	Orange	No	
005	0082_SS171	Soil Glass Jar - Unpreserved	150 mL	00260220013123	Orange	No	
005	0082_SS171	HDPE Soil Jar	200 mL	00620719008769	Grey	No	
006	0082_SS173	Soil Glass Jar - Unpreserved	150 mL	00260220013312	Orange	No	
006	0082_SS173	HDPE Soil Jar	200 mL	00620719008721	Grey	No	
007	0082_SD161	HDPE Soil Jar	200 mL	00620719026388	Grey	No	
007	0082_SD161	Soil Glass Jar - Unpreserved	150 mL	00260220014860	Orange	No	
008	0082_SD162	HDPE Soil Jar	200 mL	00620719026375	Grey	No	
008	0082_SD162	Soil Glass Jar - Unpreserved	150 mL	00261219129775	Orange	No	
009	0082_SD163	HDPE Soil Jar	200 mL	00620719008735	Grey	No	
009	0082_SD163	Soil Glass Jar - Unpreserved	150 mL	00260220013158	Orange	No	

Total Bottle Count: ALS: 18, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2102200**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 19808	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 1	Temperature	: 28.7
Receipt Detail	:	No. of samples received / analysed	: 9 / 9

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)
EP2102200-001	03-Mar-2021 14:55	0082_SD164_210303	✓	✓	✓	✓
EP2102200-002	03-Mar-2021 14:56	0082_QC102_210303	✓	✓	✓	✓
EP2102200-003	03-Mar-2021 15:27	0082_SD169_210303	✓	✓	✓	✓
EP2102200-004	03-Mar-2021 15:28	0082_SD167_210303	✓	✓	✓	✓
EP2102200-005	03-Mar-2021 15:42	0082_SS171_210303	✓	✓	✓	✓
EP2102200-006	03-Mar-2021 15:48	0082_SS173_210303	✓	✓	✓	✓
EP2102200-007	03-Mar-2021 16:15	0082_SD161_210303	✓	✓	✓	✓
EP2102200-008	03-Mar-2021 16:16	0082_SD162_210303	✓	✓	✓	✓
EP2102200-009	03-Mar-2021 16:16	0082_SD163_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	: **EP2102200**	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	: DEF19009/0082	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19808	Issue Date	: 15-Mar-2021 15:53
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 9		
No. of samples analysed	: 9		

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**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_SD164_210303	0082_QC102_210303	0082_SD169_210303	0082_SD167_210303	0082_SS171_210303
				Sampling date / time	03-Mar-2021 14:55	03-Mar-2021 14:56	03-Mar-2021 15:27	03-Mar-2021 15:28	03-Mar-2021 15:42
					EP2102200-001	EP2102200-002	EP2102200-003	EP2102200-004	EP2102200-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**8.6**	**8.4**	**9.1**	**8.4**	**8.6**
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**79**	**87**	**41**	**24**	**37**
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**16.2**	**19.5**	**4.6**	**8.8**	**7.7**
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		**17.6**	**18.5**	**3.7**	**1.9**	**3.1**
Exchangeable Magnesium	----	0.1	meq/100g		**1.5**	**1.7**	**0.3**	**0.4**	**0.6**
Exchangeable Potassium	----	0.1	meq/100g		**0.2**	**0.2**	**0.1**	**0.2**	**0.3**
Exchangeable Sodium	----	0.1	meq/100g		**0.1**	<0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	----	0.1	meq/100g		**19.4**	**20.5**	**4.2**	**2.6**	**4.1**
Exchangeable Sodium Percent	----	0.1	%		**0.5**	**0.4**	**1.2**	**3.2**	**1.6**
EP004: Organic Matter									
Organic Matter	----	0.5	%		**4.2**	**4.2**	<0.5	<0.5	**0.9**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0007**	**0.0005**	<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	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0099**	**0.0060**	**0.0004**	<0.0002	**0.0026**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<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	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<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	<0.0002

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SD164_210303	0082_QC102_210303	0082_SD169_210303	0082_SD167_210303	0082_SS171_210303
				Sampling date / time	03-Mar-2021 14:55	03-Mar-2021 14:56	03-Mar-2021 15:27	03-Mar-2021 15:28	03-Mar-2021 15:42
Compound	CAS Number	LOR	Unit		EP2102200-001	EP2102200-002	EP2102200-003	EP2102200-004	EP2102200-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		**0.0003**	**0.0003**	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		**0.0004**	**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	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<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	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<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	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<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	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<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	<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	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		**0.0010**	**0.0006**	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		**0.0015**	**0.0012**	<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	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0140**	**0.0090**	**0.0004**	<0.0002	**0.0026**

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SD164_210303	0082_QC102_210303	0082_SD169_210303	0082_SD167_210303	0082_SS171_210303
				Sampling date / time	03-Mar-2021 14:55	03-Mar-2021 14:56	03-Mar-2021 15:27	03-Mar-2021 15:28	03-Mar-2021 15:42
Compound	CAS Number	LOR	Unit		EP2102200-001	EP2102200-002	EP2102200-003	EP2102200-004	EP2102200-005
					Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0106**	**0.0065**	**0.0004**	<0.0002	**0.0026**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0131**	**0.0083**	**0.0004**	<0.0002	**0.0026**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**94.0**	**95.0**	**100**	**98.0**	**102**
13C8-PFOA	----	0.0002	%		**90.0**	**84.5**	**94.0**	**98.5**	**96.0**

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0082_SS173_210303	0082_SD161_210303	0082_SD162_210303	0082_SD163_210303	----
			Sampling date / time	03-Mar-2021 15:48	03-Mar-2021 16:15	03-Mar-2021 16:16	03-Mar-2021 16:16	----
Compound	CAS Number	LOR	Unit	EP2102200-006	EP2102200-007	EP2102200-008	EP2102200-009	--------
				Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.9	8.7	8.7	8.7	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	71	8760	11100	9910	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	7.8	32.0	25.4	32.7	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	12.8	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	0.8	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.6	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	14.2	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	0.5	----	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	22.5	22.7	29.1	----
Exchangeable Magnesium	----	0.1	meq/100g	----	5.5	7.1	10.6	----
Exchangeable Potassium	----	0.1	meq/100g	----	0.4	0.3	0.5	----
Exchangeable Sodium	----	0.1	meq/100g	----	0.3	0.4	1.0	----
Cation Exchange Capacity	----	0.1	meq/100g	----	28.7	30.5	41.2	----
Exchangeable Sodium Percent	----	0.1	%	----	1.1	1.2	2.4	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	1.0	1.9	1.2	3.0	----
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	<0.0002	<0.0002	<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	0082_SS173_210303	0082_SD161_210303	0082_SD162_210303	0082_SD163_210303	----
				Sampling date / time	03-Mar-2021 15:48	03-Mar-2021 16:15	03-Mar-2021 16:16	03-Mar-2021 16:16	----
Compound	CAS Number	LOR	Unit		EP2102200-006	EP2102200-007	EP2102200-008	EP2102200-009	--------
					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	0082_SS173_210303	0082_SD161_210303	0082_SD162_210303	0082_SD163_210303	----
			Sampling date / time	03-Mar-2021 15:48	03-Mar-2021 16:15	03-Mar-2021 16:16	03-Mar-2021 16:16	----
Compound	CAS Number	LOR	Unit	EP2102200-006	EP2102200-007	EP2102200-008	EP2102200-009	--------
				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	<0.0005	<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	<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	<0.0002	<0.0002	<0.0002	<0.0002	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**102**	**102**	**98.0**	**97.0**	----
13C8-PFOA	----	0.0002	%	**96.5**	**94.0**	**92.0**	**95.5**	----

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	: **EP2102200**	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	: DEF19009/0082	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19808	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 9		
No. of samples analysed	: 9		

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	0082_SD161_210303	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	0082_SD161_210303	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	0082_SD161_210303	EA055: Moisture Content	----	0.1	%	32.0	30.9	3.42	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3554864)									
EP2102192-001	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	0.7	0.8	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	9.0	7.5	17.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.5	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	10.4	8.9	16.0	0% - 20%
EP2102259-002	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	20.0	20.1	0.608	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.4	4.94	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	23.5	23.5	0.00	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%

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: 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	0082_SD162_210303	EP004: Organic Matter	----	0.5	%	1.2	1.3	0.00	No Limit
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	0082_SD162_210303	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	0082_SD162_210303	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

Sub-Matrix: **SOIL**

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: 3556278) - continued									
EP2102200-008	0082_SD162_210303	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
		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	0082_SD162_210303	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

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: 3556278) - continued									
EP2102192-001	Anonymous	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	0082_SD162_210303	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
ED007: Exchangeable Cations (QCLot: 3554864)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	93.5	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	95.5	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	112	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	94.8	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: 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

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: 3556278) - continued								
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)								
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	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	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

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)							
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
		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	: **EP2102200**	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/HEHB	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 9
Order number	: DEF19009/0082	No. of samples analysed	: 9

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)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_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)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_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)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_210303	**03-Mar-2021**	**----**	----	----	**09-Mar-2021**	17-Mar-2021	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303	**03-Mar-2021**	**11-Mar-2021**	31-Mar-2021	✓	**11-Mar-2021**	31-Mar-2021	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
0082_SD161_210303, 0082_SD162_210303, 0082_SD163_210303	**03-Mar-2021**	**11-Mar-2021**	31-Mar-2021	✓	**11-Mar-2021**	31-Mar-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)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_210303	**03-Mar-2021**	**12-Mar-2021**	31-Mar-2021	✓	**12-Mar-2021**	31-Mar-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_210303	**03-Mar-2021**	**10-Mar-2021**	30-Aug-2021	✓	**11-Mar-2021**	19-Apr-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0082_SD164_210303, 0082_QC102_210303, 0082_SD169_210303, 0082_SD167_210303, 0082_SS171_210303, 0082_SS173_210303, 0082_SD161_210303, 0082_SD162_210303, 0082_SD163_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	ED007	2	20	**10.00**	**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	ED007	1	20	**5.00**	**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	ED007	1	20	**5.00**	**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	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 RECORD

Eurofins | Environment Testing

☐ 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 — EnviroSampleBNE@eurofins.com

☐ Perth Laboratory — Unit 2 51 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-B	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	DEF19009/630			Email for Results	maelle.bourdais@cardno.com.au derp.labreports@esdat.com.au
Quote ID №					

Analytes — When metals are requested, please specify "Total" or "Filtered". SUITE code must be used to obtain SUITE pricing

Containers — Change container type if/as if necessary

Required Turnaround Time (TAT) — Default will be 5 days if not ticked.

- ☐ 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	0082_QC201_210303	3/3/21	W	X	X	X										779272-Ma18441-
2	0082_QC202_210303	3/3/21	S	X			X									↓ Ma18442-
3																
4																
5																
6																
7																
8																
9																
10																
	Total Counts															

Method of Shipment: ☑ Courier (#) ☐ Hand Delivered ☐ Postal — Name: Ashley Brown — Signature: Ashley — 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 №	779272

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

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

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Site # 23736

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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-B
Project ID:	WA_0082_PFASOMP
Turnaround time:	5 Day
Date/Time received	Mar 8, 2021 11:30 AM
Eurofins reference	779272

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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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)
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

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005

Attention: **Maelle Bourdais**

Report **779272-S**
Project name HEH-B
Project ID WA_0082_PFASOMP
Received Date Mar 08, 2021

Client Sample ID			**0082_QC202_210303**
Sample Matrix			**Soil**
Eurofins Sample No.			**M21-Ma18442**
Date Sampled			**Mar 03, 2021**
Test/Reference	LOR	Unit	
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	96
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	7.4
Total Organic Carbon	0.1	%	4.6
% Moisture	1	%	17
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	%	109
13C5-PFPeA (surr.)	1	%	101
13C5-PFHxA (surr.)	1	%	105
13C4-PFHpA (surr.)	1	%	101
13C8-PFOA (surr.)	1	%	108
13C5-PFNA (surr.)	1	%	124
13C6-PFDA (surr.)	1	%	140
13C2-PFUnDA (surr.)	1	%	122
13C2-PFDoDA (surr.)	1	%	118
13C2-PFTeDA (surr.)	1	%	138
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			0082_QC202_210303
Sample Matrix			**Soil**
Eurofins Sample No.			**M21-Ma18442**
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	%	107
D3-N-MeFOSA (surr.)	1	%	93
D5-N-EtFOSA (surr.)	1	%	91
D7-N-MeFOSE (surr.)	1	%	131
D9-N-EtFOSE (surr.)	1	%	95
D5-N-EtFOSAA (surr.)	1	%	92
D3-N-MeFOSAA (surr.)	1	%	71
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	%	112
18O2-PFHxS (surr.)	1	%	120
13C8-PFOS (surr.)	1	%	117
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	%	96
13C2-6:2 FTSA (surr.)	1	%	111
13C2-8:2 FTSA (surr.)	1	%	91
13C2-10:2 FTSA (surr.)	1	%	79
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 15, 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 10, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Mar 10, 2021	180 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

eurofins | Environment Testing

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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 #:**	779272	**Due:**	Mar 16, 2021
		Phone:	08 9273 3888	**Priority:**	5 Day
		Fax:	08 9388 3831	**Contact Name:**	Maelle Bourdais
Project Name:	HEH-B				
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	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	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)	S21-Ma27706	NCP	%	104			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S21-Ma27706	NCP	%	103			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S21-Ma27706	NCP	%	106			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S21-Ma27706	NCP	%	98			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S21-Ma27706	NCP	%	98			50-150	Pass	
Perfluorononanoic acid (PFNA)	S21-Ma27706	NCP	%	103			50-150	Pass	
Perfluorodecanoic acid (PFDA)	S21-Ma27706	NCP	%	104			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S21-Ma27706	NCP	%	106			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S21-Ma27706	NCP	%	109			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	S21-Ma27706	NCP	%	107			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S21-Ma27706	NCP	%	106			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	S21-Ma27706	NCP	%	111			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S21-Ma27706	NCP	%	115			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S21-Ma27706	NCP	%	105			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S21-Ma27706	NCP	%	107			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S21-Ma27706	NCP	%	93			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S21-Ma27706	NCP	%	97			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S21-Ma27706	NCP	%	98			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S21-Ma27706	NCP	%	87			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S21-Ma27706	NCP	%	105			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S21-Ma27706	NCP	%	95			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S21-Ma27706	NCP	%	99			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S21-Ma27706	NCP	%	99			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S21-Ma27706	NCP	%	114			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S21-Ma27706	NCP	%	103			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S21-Ma27706	NCP	%	106			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-Ma27706	NCP	%	94			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S21-Ma27706	NCP	%	92			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S21-Ma27706	NCP	%	99			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S21-Ma27706	NCP	%	110			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	B21-Ma14561	NCP	%	4.9	4.9	<1	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-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S21-Ma27705	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S21-Ma27705	NCP	ug/kg	< 10	< 10	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	S21-Ma27705	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-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S21-Ma27705	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S21-Ma27705	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S21-Ma27705	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
11 Harvest Terrace
West Perth
WA 6005

Attention: **Maelle Bourdais**

Report **779272-W**
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	%	52
13C5-PFPeA (surr.)	1	%	53
13C5-PFHxA (surr.)	1	%	66
13C4-PFHpA (surr.)	1	%	65
13C8-PFOA (surr.)	1	%	99
13C5-PFNA (surr.)	1	%	101
13C6-PFDA (surr.)	1	%	85
13C2-PFUnDA (surr.)	1	%	86
13C2-PFDoDA (surr.)	1	%	85
13C2-PFTeDA (surr.)	1	%	84
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	%	96
D3-N-MeFOSA (surr.)	1	%	105
D5-N-EtFOSA (surr.)	1	%	93
D7-N-MeFOSE (surr.)	1	%	69
D9-N-EtFOSE (surr.)	1	%	75
D5-N-EtFOSAA (surr.)	1	%	50
D3-N-MeFOSAA (surr.)	1	%	48
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]0.06
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	%	65
18O2-PFHxS (surr.)	1	%	93
13C8-PFOS (surr.)	1	%	81
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	%	59
13C2-6:2 FTSA (surr.)	1	%	79
13C2-8:2 FTSA (surr.)	1	%	INT
13C2-10:2 FTSA (surr.)	1	%	99
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 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
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)			

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Company Name: Cardno (WA)
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

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.

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Site	Monitoring Site ID	Date	Sample ID	Sampling Method	Sample Depth (m)	WaterBody Depth (m)	Comments	Temperature C	DO (mg/L)	EC (us/Cm)	pH	Eh (mV)+	Water Colour	Turbidity
Harold E Holt Area B	SW164	3/03/2021	0082_SW164_210303				Dry							
Harold E Holt Area B	SW165	3/03/2021	0082_SW165_210303				Dry							
Harold E Holt Area B	SW181	3/03/2021	0082_SW181_210303	Direct_into_Bottle	0.1	0.2	Qc101/201	31.7	4.21	70491	8.26	103.6	Yellow	Low,Medium
Harold E Holt Area B	SW161	3/03/2021	0082_SW161_210303	Direct_into_Bottle	0.01	0.05		34.9	3.23	42812	7.89	79.2	Colourless	Low
Harold E Holt Area B	SW162	3/03/2021	0082_SW162_210303	Direct_into_Bottle	0.01	0.05		34.5	2.69	55574	7.71	79	Colourless	Low
Harold E Holt Area B	SW163	3/03/2021	0082_SW163_210303	Direct_into_Bottle	0.01	0.05		35.1	1.13	56275	7.56	72.3	Colourless	Low
Harold E Holt Area B	SW162	3/03/2021	0082_SW162_210303	Direct_into_Bottle	0.01	0.05		34.5	2.69	55574	7.71	79	Colourless	Low

Site	Monitoring Location	Date	Sample ID	Depth of Sediment Sampling (m)	Sampling Method	Sample Condition	Sample Description	QC
Harold E Holt Area B	SD164	3/03/21	0082_SD164_210303	0.1	Shovel Trowel	Dry	Brown/red, soil, dry, fine to med	QC102, QC202
Harold E Holt Area B	SS167	3/03/21	0082_SS167_210303	0.1	Direct into Bottle	Wet	Red, none, slightly noist, fine/med grained	
Harold E Holt Area B	SS169	3/03/21	0082_SS169_210303	0.2	Direct into Bottle	Dry	Yellow/red, none, fine/med sand	
Harold E Holt Area B	SS171	3/03/21	0082_SS171_210303	0.1	Direct into Bottle	Dry	Red, none, dry fine sand	
Harold E Holt Area B	SS173	3/03/21	0082_SS173_210303	0.1	Direct into Bottle	Dry	Red, none, fine slightly moist sand	
Harold E Holt Area B	SD161	3/03/21	0082_SD161_210303	0.3	Direct into Bottle	Wet	Brown, stagnant, wet clay	
Harold E Holt Area B	SD162	3/03/21	0082_SD162_210303	0.1	Direct into Bottle	Wet	Brown/grey, stagnant, wet clay	
Harold E Holt Area B	SS165	3/03/21	0082_SS165_210303	0.1	Shovel Trowel	Dry	Orange, no odour, moist	
Harold E Holt Area B	SD181	3/03/21	0082_SD181_210303	0.1	Direct into Bottle	Wet	Slight organic odour, brown silty sand	
Harold E Holt Area B	SD163	3/03/21	0082_SD163_210303	0.3	Direct into Bottle	Wet	Grey, organic, wet clay	
Harold E Holt Area B	SS179	4/03/21	0082_SS179_210304	0.1	Shovel Trowel	Dry	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 March 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (PFAS OMP SAQP HEH-B, 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 4 primary water samples (25%)
1 for 11 primary sediment samples (9.1%)</td></tr>
<tr><td>Split duplicate</td><td>1 in 10 primary samples (10%)</td><td>1 for 4 primary water samples (25%)
1 for 11 primary sediment samples (9.1%)</td></tr>
<tr><td>Rinsate</td><td>1 per day per YSI</td><td>1 for 1 days (100%)</td></tr>
<tr><td>Field Blank</td><td>1 per day per sampler</td><td>1 for 1 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: 4
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 2.1%
Sediment
▪ Number of Primary Samples Analysed: 11
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 9.8%
The level of RPD 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 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: 4
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 8.8%
Sediment
▪ Number of Primary Samples Analysed: 11
▪ Duplicate Samples Analysed: 1
▪ Percentage of RPDs Exceeding Criteria: 12.1%
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 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 surrogate recovery outliers. 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 B

Prepared for

Department of Defence

10 August 2021

Cardno®

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0.0	9/07/2021	Internal Draft	MB	DJ
Rev 0	14/07/2021	Client Submission / Review	MB	DJ
Rev 1	10/08/2021	Revision 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)
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-B	Naval Communication Station Harold E Holt Area B
OMP	Ongoing Monitoring Plan
WWTP	Waste water treatment plant

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 B ("HEH-B" 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 B*'.

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 B.

> "the Management Area" was defined as comprising the Site, plus the land extending to the Exmouth Gulf (to the east and north-east) (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
On-Site – Source South	0082_MW310, 0082_MW311, 0082_MW315, 0082_MW103_D, 0082_MW113, 0082_MW115, 0082_MW142, 0082_MW143
Off-Site – Source South	0082_MW135, 0082_MW122, 0082_MW126, 0082_MW144_S
On-Site – Source North	0082_MW326, 0082_MW105_S, 0082_MW109, 0082_MW145
Off-Site – Source North	0082_MW134, 0082_MW147, 0082_MW148_S
Off-Site - Pathway 1	0082_MW151_S, 0082_MW152_S, 0082_MW153_S, 0082_MW154_S, 0082_MW137, 0082_MW155_S
Off-Site - Pathway 2	0082_MW118_D, 0082_MW133, 0082_MW022
Off-Site - Receptor A	0082_MW128, 0082_MW129, 0082_MW130, 0082_MW131, 0082_MW132

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
Off-Site - Receptor C	0082_OTH101, 0082_OTH102, 0082_OTH103, 0082_OTH104, 0082_OTH105, 0082_OTH106

[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
Off-Site - Pathway 2	0082_SW164, 0082_SW181, 0082_SS165, 0082_SW167, 0082_SW169, 0082_SW171, 0082_SW173, 0082_SW179
Off-Site - Receptor B	0082_SW161, 0082_SW162, 0082_SW163

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
Off-Site - Pathway 2	0082_SD164, 0082_SD181, 0082_SS165, 0082_SS167, 0082_SS169, 0082_SS171, 0082_SS173, 0082_SS179
Off-Site - Receptor B	0082_SD161, 0082_SD162, 0082_SD163

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
MW129, MW132	Dissolved organic carbon (DOC) not analysed	Insufficient amount of water to filter and fill DOC vial
MW128	DOC not analysed	Total organic carbon (TOC) analysed instead. Sample not field filtered due to high turbidity.
SW164, SW165, SW167, SW169, SW171, SW173, SW179	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 and bump tested daily to optimise the accuracy of the measurements taken. Calibration certificates and bump tests records 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 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.

Activity	Details
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. ▪ 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). ▪ TOC, 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		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

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). However, the drainage channel going from the Site to the Exmouth Gulf was observed to be dry at the time of monitoring (21-22 June 2021).

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 condition was recorded to be aerobic (DO ranging from 0.75 to 8.48 mg/L), fresh to saline (TDS ranging from 306.8 to 34,580 mg/L), neutral to slightly alkaline (pH ranging from 7 to 8.82) and the average groundwater temperature was25ºC. Field parameters were generally consistent with the previous monitoring events.

4.2.1.2 Groundwater Elevation and Migration

Groundwater flow direction was interpreted to be in a generally easterly direction towards the Exmouth Gulf which is consistent with previous monitoring events, except for the westernmost area of the Site where a westerly groundwater flow direction was interpreted.

Groundwater elevation contours and flow direction are shown in Figure 3, Appendix A. Gauging records are presented in Appendix D. Groundwater elevations were approximately 0.5m shallower than during the June 2020 event which can be related to the recent rainfall events.

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]	1.24 (MW118D)	33	0
PFOS	MW022, MW103D, MW105S, MW113, MW115, MW118D, MW122, MW126, MW130, MW142, MW143, MW144S, MW154S, MW310, MW311, MW326.	0.01[3]	48.6 (MW142)	33	16
Sum of PFHxS and PFOS	MW022, MW103D, MW105S, MW115, MW118D, MW126, MW142, MW143, MW144S, MW310.	2[2]	51.9 (MW142)	33	10

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:

- MW126 (off-Site, Source South, WWTP) reported a new exceedance of the human health criteria for recreation use for the sum of PFOS and PFHxS (detected concentration of 2.90 µg/L).
- There was no first time detection of PFOA or the sum of PFOS and PFHxS at the groundwater monitoring locations during the June 2021 monitoring event.

4.3 Seepage Water

4.3.1 Summary of Field Observations

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. Seepage water temperature was 21°C on average, field readings indicate aerobic, saline, near neutral and reducing seepage water conditions. Field parameters were generally consistent with the previous monitoring events.

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 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 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	6	0
PFOS	-	0.01[3]	<0.01	6	0
Sum of PFHxS and PFOS	-	2[2]	<0.01	6	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:

- All six seepage water samples reported PFAS concentrations below the laboratory LOR.
- 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.
- No new exceedance of a guideline value was reported for any of the seepage water monitoring locations during the June 2021 monitoring event.

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.

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 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 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]	<0.01	4	0
PFOS	-	0.01[3]	<0.01	4	0
Sum of PFHxS and PFOS	-	2[2]	<0.01	4	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:

- The four surface water samples collected reported PFAS concentrations below the laboratory LOR.
- There was no first time detection of PFOA or Sum of PFOS and PFHxS at the surface water monitoring locations sampled during the June 2021 monitoring event.

4.5 Sediment

4.5.1 Summary of Field Observations

Observations recorded during the sediment sampling program are provided in the field sampling records 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	11	0
PFOS	-	0.01[3]	0.0056 (SS171)	11	0
Sum of PFHxS and PFOS	-	20[4]	0.0056 (SS171)	11	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:

- Of the 11 samples tested, three samples were reported above the LOR for PFOS and sum of PFHxS and PFOS and none was above the LOR for PFOA.
- There was no new exceedance of guideline values or first-time detection of PFOA or Sum of PFOS and PFHxS at the sediment monitoring locations during the June 2021 monitoring event.

4.6 Changes to the Monitoring Network Condition

No changes to the monitoring network condition were noted during the June 2021 sampling event.

5 Summary and Conclusions

Cardno undertook the June 2021 groundwater, seepage water, surface water and sediment monitoring event at HEH-B as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 33 monitoring wells, four (4) surface water locations, six (6) seepage water sampling locations and 11 sediment monitoring locations.

Groundwater levels were gauged in all wells before sampling. Groundwater flow direction was interpreted to be generally easterly (i.e. groundwater flows towards the ocean), which is consistent with previous monitoring events, except for the westernmost area of the Site where groundwater flows toward the west. Groundwater elevation was approximately 0.5m shallower than during the June 2020 event which can be related to the recent rainfall events

The groundwater laboratory results reported the following:

- Of the 33 samples that were tested, PFOS (16 samples) and Sum of PFHxS and PFOS (10 samples) reported concentrations that exceeded the HEPA (2020) ecological guideline value for 99% protection species and HEPA (2020) guideline value for recreational use respectively .
- MW126 (off-Site, Source South, WWTP) reported a new exceedance of the human health criteria for recreation use for the sum of PFOS and PFHxS (detected concentration of 2.90 µg/L).
- There was no first time detection of PFOA or the sum of PFOS and PFHxS at the groundwater monitoring locations during the June 2021 monitoring event.

The seepage water laboratory results reported the following:

- All six samples that were tested reported PFAS concentrations below the laboratory LOR.
- No first-time detection of PFOA or Sum of PFOS and PFHxS, or new exceedance of guideline value were reported at any of the seepage water monitoring locations.

The surface water laboratory results reported the following:

- The four surface water samples collected reported PFAS concentrations below the laboratory LOR.
- There was no first time detection of PFOA or Sum of PFOS and PFHxS at the surface water monitoring locations sampled during the June 2021 monitoring event.

The sediment laboratory results reported the following:

- Of the 11 samples tested, three samples were reported above the LOR for PFOS and sum of PFHxS and PFOS and none was above the LOR for PFOA.
- There was no new exceedance of guideline values or first-time detection of PFOA or Sum of PFOS and PFHxS at the sediment monitoring locations during the June 2021 monitoring event.

The next OMP sampling event for HEH-B 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 Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
3. *Contaminated Sites Act 2003*, Western Australia.
4. Department of Defence, May 2021, PFAS OMP Factual Report Guidance Version 0.2.
5. Department of Defence, July 2018 amended August 2019, *Contamination Management Manual*, Annex L *Guidance on Data Management*.
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
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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)'.

Site Specific References

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19. GHD Pty Ltd, December 2018, reference: 3135526,'Naval Communication Station Harold E Holt – Area B PFAS Investigations Detailed Site Investigation Report'.
20. GHD Pty Ltd, May 2019, reference: 3135526, 'Harold E Holt B Ecological Risk Assessment'.
21. Cardno, April 2020, PFAS OMP Biannual Monitoring Factual Report, 2019 Post-Winter.
22. Cardno, June 2021, PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Rev 5.
23. Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report.
24. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post Summer, HEH-B
25. Cardno, February 2021, PFAS OMP Biannual Monitoring Factual Report, 2020 Post Winter, HEH-B
26. Cardno, May 2021, PFAS OMP First Flush Sampling Event Factual Report, March 2021, HEH-B
27. Cardno, June 2021, PFAS OMP 2020 Annual Interpretive Report, HEH-B

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 B
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_0082-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth

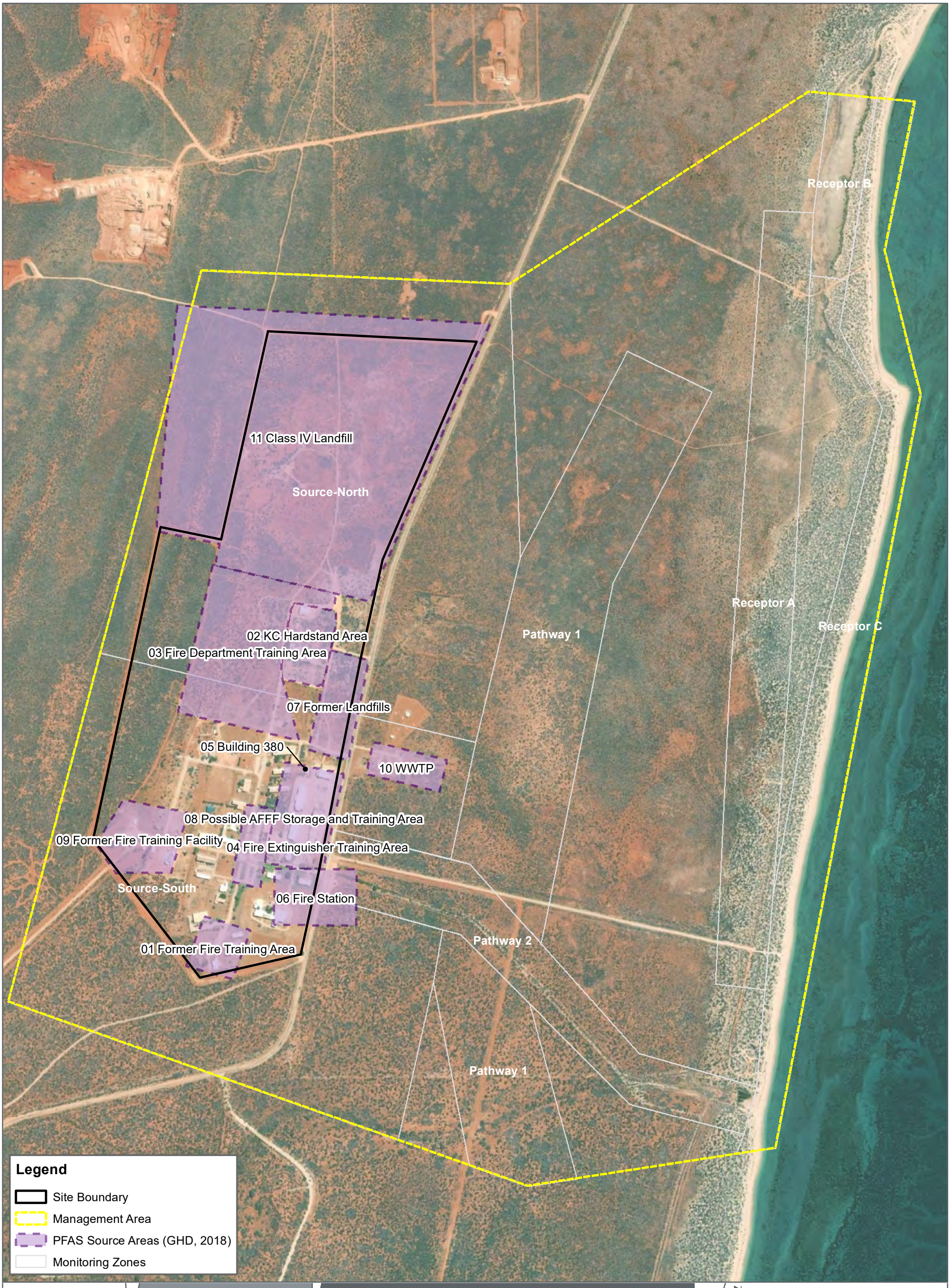

FIGURE 2

1:11,500 Scale at A3

Meters

0 250 500

Management Area

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-002_ManagementAreas 02.mxd
Aerial Imagery Supplied by Google Earth

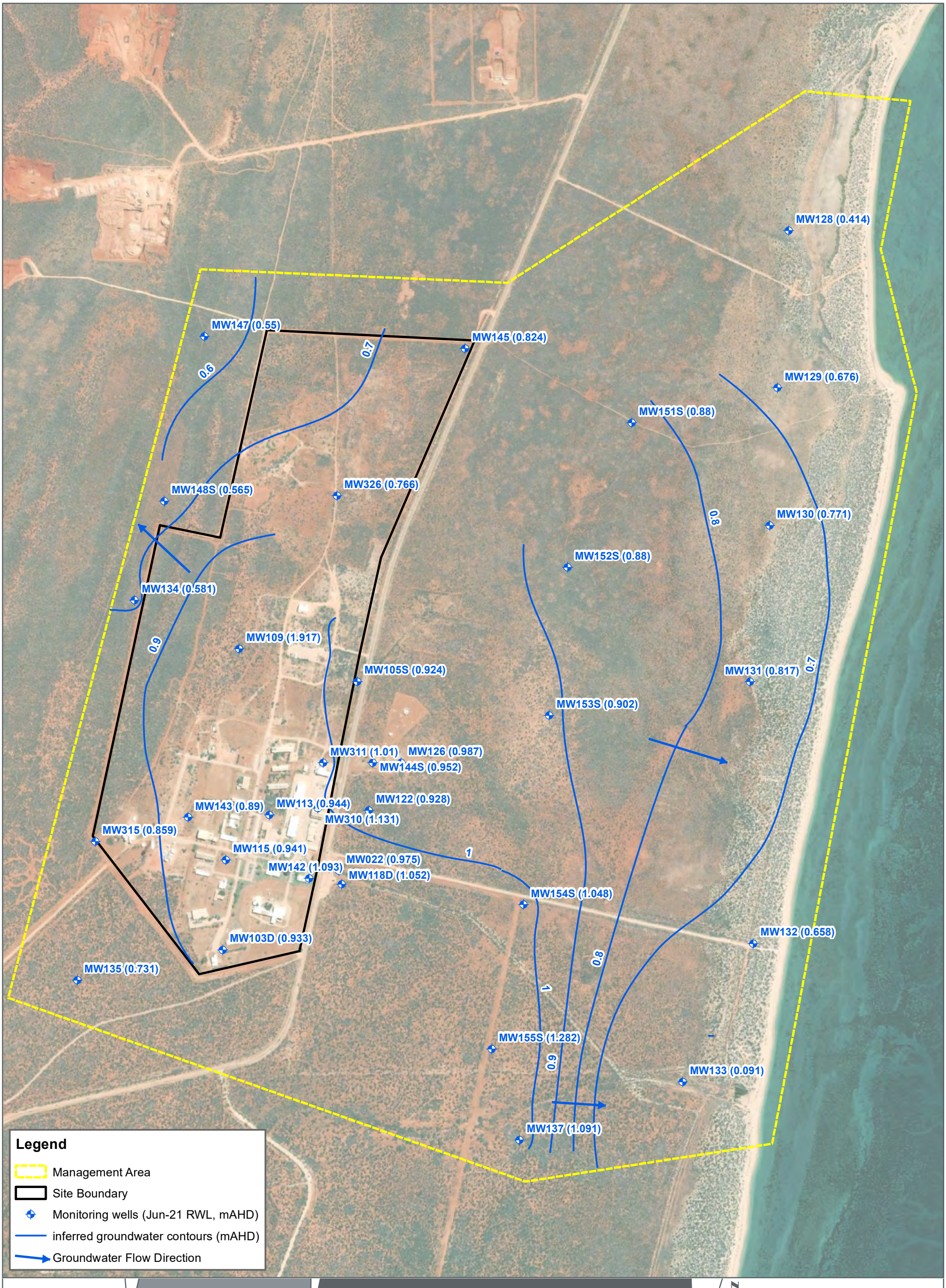

FIGURE 3

1:11,500 Scale at A3

Meters

0 250 500

Inferred Groundwater Contours

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-003_GroundwaterContoursJun-21 01.mxd
Aerial Imagery Supplied by Google Earth

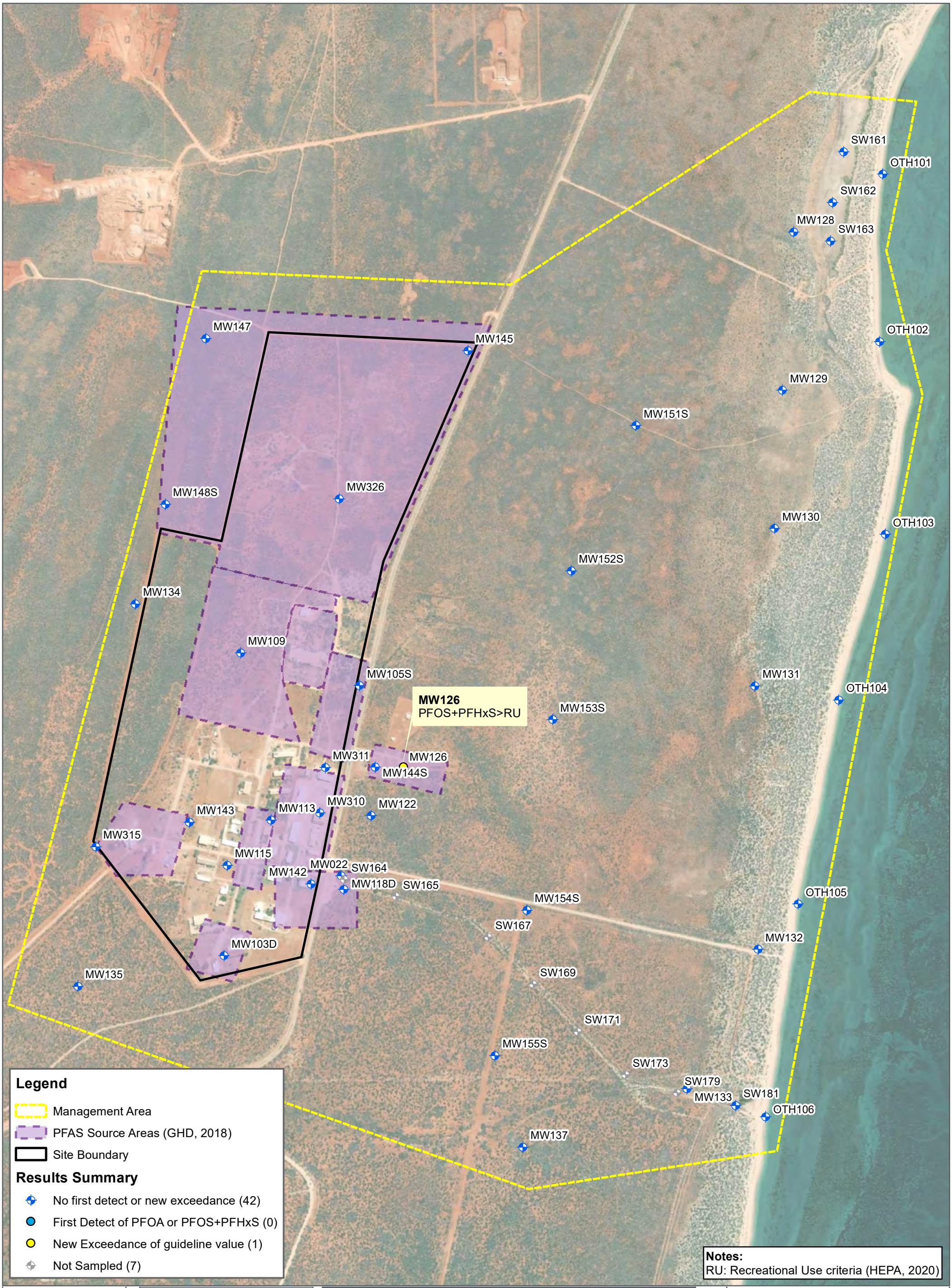

FIGURE 4

1:11,500 Scale at A3

Meters

0 250 500

Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-004_WResults_June21 02.mxd
Aerial Imagery Supplied by Google Earth

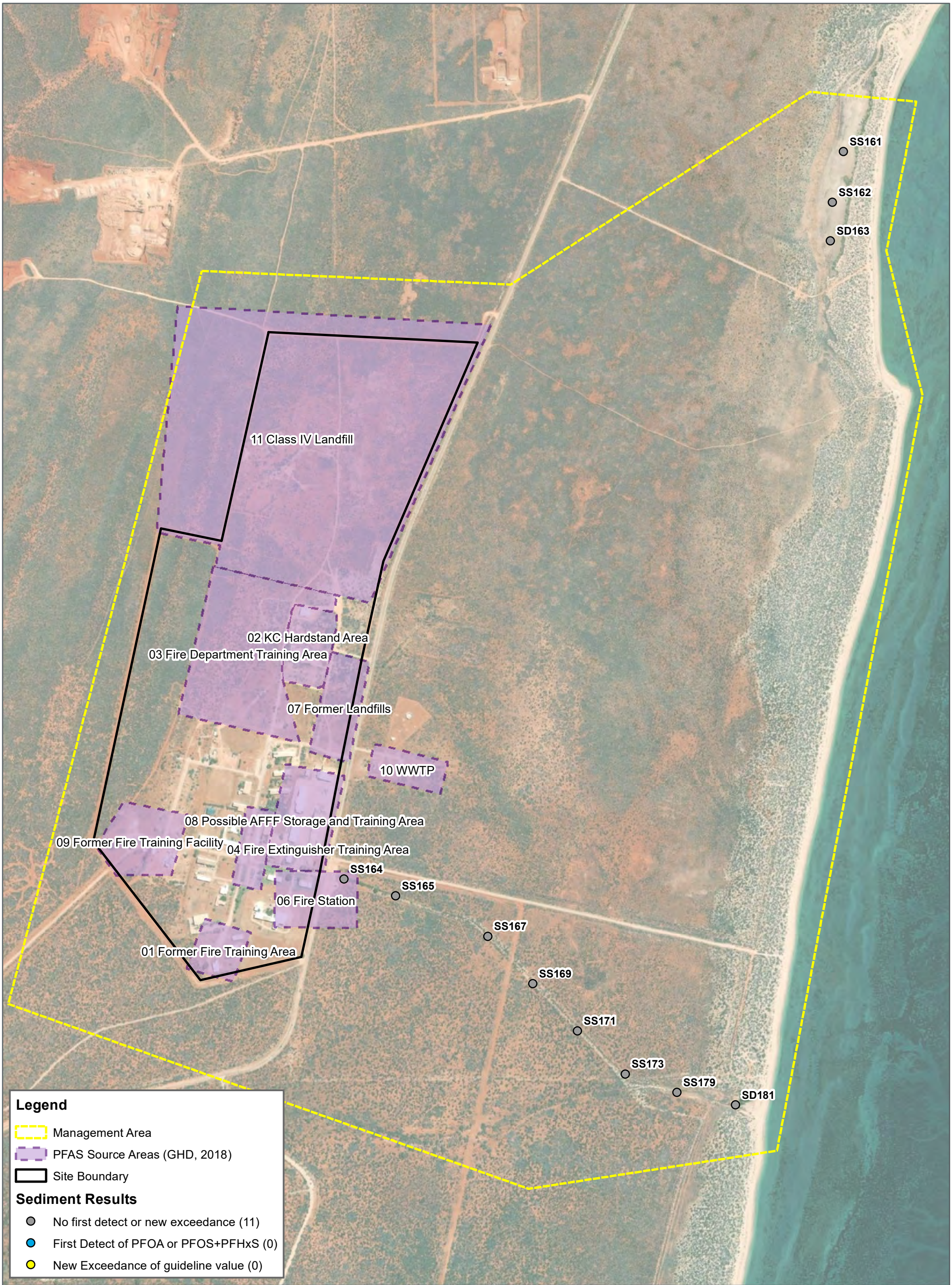

FIGURE 5

1:11,500 Scale at A3

Meters

0 250 500

Sediment Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
HAROLD E HOLT AREA B
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_0082-GS-005_SResults_Jun21 01.mxd
Aerial Imagery Supplied by Google Earth

APPENDIX

B

DATA ASSESSMENT TABLES

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelor	
	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)
	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
PFAS NEMP 2020 Interim Marine 99%					*0.00023**						*19*								
PFAS NEMP 2020 Recreational Water											10								
Field ID	Date	Location Code	Lab Report Number																
0082_MW022_210622	22/06/2021	MW022	EP2107092	0.09	0.12	1.31	0.07	*3.19*	<0.02	0.3	0.95	0.88	0.81	0.56	<0.02	<0.02	0.36	<0.05	<0.02	<0.02	<0.05	0.18
0082_MW103D_210621	21/06/2021	MW103D	EP2107028	0.27	0.37	2.82	0.13	*2.64*	<0.02	<0.1	0.74	0.21	0.07	0.08	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0082_MW105S_210621	21/06/2021	MW105S	EP2107028	0.14	0.20	1.66	0.06	*6.18*	<0.02	0.2	0.78	0.50	0.48	0.33	<0.02	<0.02	0.13	<0.05	<0.02	<0.02	<0.05	<0.05
0082_MW109_210621	21/06/2021	MW109	EP2107033	<0.02	<0.02	0.08	<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
0082_MW113_210621	21/06/2021	MW113	EP2107028	0.02	0.02	0.23	<0.02	*0.06*	<0.02	<0.1	0.03	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0082_MW115_210621	21/06/2021	MW115	EP2107028	0.17	0.26	3.42	0.21	*12.2*	<0.02	0.8	2.36	2.36	0.91	0.53	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	4.51
0082_MW118D_210621	21/06/2021	MW118D	EP2107033	0.70	0.70	5.53	0.64	*12.9*	<0.02	0.4	2.03	1.29	0.61	1.24	<0.02	<0.02	0.10	<0.05	<0.02	<0.02	0.06	12.5
0082_MW122_210622	22/06/2021	MW122	EP2107092	0.15	0.15	1.34	0.04	*0.32*	<0.02	0.1	0.44	0.34	0.17	0.12	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0082_MW126_210621	21/06/2021	MW126	EP2107033	0.06	0.07	0.65	0.04	*2.25*	<0.02	0.2	0.50	0.50	0.24	0.16	<0.02	<0.02	0.06	<0.05	<0.02	<0.02	<0.05	<0.05
0082_MW128_3.7-4.2_210621	21/06/2021	MW128	EP2107024	<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
0082_MW129_3.5-4.0_210621	21/06/2021	MW129	EP2107024	<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
0082_MW130_6.9-7.4_210621	21/06/2021	MW130	EP2107024	<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
0082_MW131_4.0-4.5_210621	21/06/2021	MW131	EP2107024	<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
0082_MW132_8.5-9.0_210621	21/06/2021	MW132	EP2107024	<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
0082_MW133_3.0-3.5_210621	21/06/2021	MW133	EP2107024	<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
0082_MW134_210621	21/06/2021	MW134	EP2107033	<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
0082_MW135_210621	21/06/2021	MW135	EP2107028	<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
0082_MW137_8.1-8.6_210621	21/06/2021	MW137	EP2107024	<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
0082_MW142_210621	21/06/2021	MW142	EP2107028	0.42	0.46	3.27	1.07	*48.6*	<0.02	1.7	3.47	4.47	1.28	0.74	<0.02	<0.02	0.16	<0.05	<0.02	<0.02	<0.05	4.74
0082_MW143_210621	21/06/2021	MW143	EP2107028	0.06	0.06	0.66	0.08	*2.70*	<0.02	0.3	0.95	0.95	0.46	0.30	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	1.48
0082_MW144S_210621	21/06/2021	MW144S	EP2107033	0.27	0.36	2.89	0.17	*8.36*	<0.02	0.7	2.22	2.44	2.08	0.95	<0.02	<0.02	0.35	<0.05	<0.02	<0.02	<0.05	0.54
0082_MW145_210621	21/06/2021	MW145	EP2107028	<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
0082_MW147_210622	22/06/2021	MW147	EP2107183	<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
0082_MW148S_210621	21/06/2021	MW148S	EP2107033	<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
0082_MW151S_210621	21/06/2021	MW151S	EP2107024	<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
0082_MW152S_210622	22/06/2021	MW152S	EP2107092	<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
0082_MW153S_210622	22/06/2021	MW153S	EP2107086	<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
0082_MW154S_210621	21/06/2021	MW154S	EP2107033	0.13	0.11	0.53	0.03	*0.54*	<0.02	<0.1	0.14	0.14	0.06	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0082_MW155S_210621	21/06/2021	MW155S	EP2107024	<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
0082_MW310_210621	21/06/2021	MW310	EP2107028	1.50	2.36	12.0	0.27	*3.66*	<0.02	1.0	7.21	3.66	1.36	0.34	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.44
0082_MW311_210621	21/06/2021	MW311	EP2107028	<0.02	<0.02	0.49	<0.02	*0.26*	<0.02	<0.1	0.24	0.19	0.17	0.08	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0082_MW315_210621	21/06/2021	MW315	EP2107033	<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
0082_MW326_210621	21/06/2021	MW326	EP2107028	<0.02	<0.02	0.06	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0082_OTH101_210621	21/06/2021	OTH101	EP2107024	<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
0082_OTH102_210621	21/06/2021	OTH102	EP2107024	<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
0082_OTH103_210621	21/06/2021	OTH103	EP2107024	<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
0082_OTH104_210621	21/06/2021	OTH104	EP2107024	<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
0082_OTH105_210621	21/06/2021	OTH105	EP2107024	<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
0082_OTH106_210621	21/06/2021	OTH106	EP2107024	<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
0082_SW161_210621	21/06/2021	SW161	EP2107025	<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
0082_SW162_210621	21/06/2021	SW162	EP2107025	<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
0082_SW163_210621	21/06/2021	SW163	EP2107025	<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
0082_SW181_210621	21/06/2021	SW181	EP2107025	<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

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,

	her Sulfonic Acids		PFAS - Perfluoroalkyl Sulfonamides							PFAS			
	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)
	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
LOR - Limit of Reporting	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
PFAS NEMP 2020 Interim Marine 99%													
PFAS NEMP 2020 Recreational Water											2		
Field ID	Date	Location Code	Lab Report Number										
0082_MW022_210622	22/06/2021	MW022	EP2107092	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	8.27	4.50	8.82	<1
0082_MW103D_210621	21/06/2021	MW103D	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	6.83	5.46	7.33	<1
0082_MW105S_210621	21/06/2021	MW105S	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	10.3	7.84	10.7	<1
0082_MW109_210621	21/06/2021	MW109	EP2107033	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.08	0.08	0.08	<1
0082_MW113_210621	21/06/2021	MW113	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.34	0.29	0.36	<1
0082_MW115_210621	21/06/2021	MW115	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	27.3	15.6	27.8	<1
0082_MW118D_210621	21/06/2021	MW118D	EP2107033	0.08	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	37.3	18.4	38.8	<1
0082_MW122_210622	22/06/2021	MW122	EP2107092	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	2.98	1.66	3.17	<1
0082_MW126_210621	21/06/2021	MW126	EP2107033	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	4.56	2.90	4.73	<1
0082_MW128_3.7-4.2_210621	21/06/2021	MW128	EP2107024	<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
0082_MW129_3.5-4.0_210621	21/06/2021	MW129	EP2107024	<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
0082_MW130_6.9-7.4_210621	21/06/2021	MW130	EP2107024	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02	0.02	<1
0082_MW131_4.0-4.5_210621	21/06/2021	MW131	EP2107024	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	32
0082_MW132_8.5-9.0_210621	21/06/2021	MW132	EP2107024	<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
0082_MW133_3.0-3.5_210621	21/06/2021	MW133	EP2107024	<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
0082_MW134_210621	21/06/2021	MW134	EP2107033	<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
0082_MW135_210621	21/06/2021	MW135	EP2107028	<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
0082_MW137_8.1-8.6_210621	21/06/2021	MW137	EP2107024	<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
0082_MW142_210621	21/06/2021	MW142	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	68.7	51.9	70.4	<1
0082_MW143_210621	21/06/2021	MW143	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	7.86	3.36	8.00	6
0082_MW144S_210621	21/06/2021	MW144S	EP2107033	0.16	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	20.6	11.2	21.5	<1
0082_MW145_210621	21/06/2021	MW145	EP2107028	<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
0082_MW147_210622	22/06/2021	MW147	EP2107183	<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
0082_MW148S_210621	21/06/2021	MW148S	EP2107033	<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
0082_MW151S_210621	21/06/2021	MW151S	EP2107024	<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
0082_MW152S_210622	22/06/2021	MW152S	EP2107092	<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
0082_MW153S_210622	22/06/2021	MW153S	EP2107086	<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
0082_MW154S_210621	21/06/2021	MW154S	EP2107033	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.59	1.07	1.73	<1
0082_MW155S_210621	21/06/2021	MW155S	EP2107024	<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
0082_MW310_210621	21/06/2021	MW310	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	31.2	15.7	33.8	<1
0082_MW311_210621	21/06/2021	MW311	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.43	0.75	1.43	<1
0082_MW315_210621	21/06/2021	MW315	EP2107033	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	10
0082_MW326_210621	21/06/2021	MW326	EP2107028	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.10	0.08	0.10	<1
0082_OTH101_210621	21/06/2021	OTH101	EP2107024	<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
0082_OTH102_210621	21/06/2021	OTH102	EP2107024	<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
0082_OTH103_210621	21/06/2021	OTH103	EP2107024	<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
0082_OTH104_210621	21/06/2021	OTH104	EP2107024	<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
0082_OTH105_210621	21/06/2021	OTH105	EP2107024	<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
0082_OTH106_210621	21/06/2021	OTH106	EP2107024	<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
0082_SW161_210621	21/06/2021	SW161	EP2107025	<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
0082_SW162_210621	21/06/2021	SW162	EP2107025	<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
0082_SW163_210621	21/06/2021	SW163	EP2107025	<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
0082_SW181_210621	21/06/2021	SW181	EP2107025	<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

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,

				Inorganics												Metals			Organic
				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	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
				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				1	1	1	0.01	0.01	1	0.01	0.01	1	1	10	1	5	1	1	1	1
PFAS NEMP 2020 Interim Marine 99%																				
PFAS NEMP 2020 Recreational Water																				
Field ID	Date	Location Code	Lab Report Number																	
0082_MW022_210622	22/06/2021	MW022	EP2107092	381	<1	381	12.2	12.0	125	0.95	8.05	183	51	698		406	24	23	36	6
0082_MW103D_210621	21/06/2021	MW103D	EP2107028	245	<1	245	55.0	69.2	1,660	11.5	7.49	805	156	6,030		108	337	200	37	<1
0082_MW105S_210621	21/06/2021	MW105S	EP2107028	813	<1	813	51.8	51.8	1,060	0.02	7.95	984	273	3,110		2,020	29	66	85	5
0082_MW109_210621	21/06/2021	MW109	EP2107033	491	<1	491	120	115	3,240	2.18	7.99	2,350	900	6,920	8	1,790	44	91	114	
0082_MW113_210621	21/06/2021	MW113	EP2107028	543	<1	543	35.1	32.7	736	3.54	8.13	664	169	2,100		315	16	23	45	4
0082_MW115_210621	21/06/2021	MW115	EP2107028	294	<1	294	47.7	47.2	1,310	0.57	7.66	705	234	3,040		414	101	114	81	3
0082_MW118D_210621	21/06/2021	MW118D	EP2107033	672	<1	672	65.0	64.3	1,630	0.56	8.08	1,270	271	3,840		148	28	67	85	<2
0082_MW122_210622	22/06/2021	MW122	EP2107092	687	<1	687	89.6	85.5	2,230	2.34	7.98	1,770	624	5,300		565	28	61	83	5
0082_MW126_210621	21/06/2021	MW126	EP2107033	409	<1	409	24.7	26.2	505	2.91	7.90	474	109	1,400		69	47	29	32	2
0082_MW128_3.7-4.2_210621	21/06/2021	MW128	EP2107024	220	<1	220	607	722	19,500	8.66	7.51	12,500	2,540	39,900	32	57,700	588	1,610	664	
0082_MW129_3.5-4.0_210621	21/06/2021	MW129	EP2107024	157	<1	157	603	696	19,400	7.17	7.73	12,000	2,520	40,500		213	537	1,590	641	
0082_MW130_6.9-7.4_210621	21/06/2021	MW130	EP2107024	185	<1	185	559	649	18,000	7.44	7.65	11,200	2,280	36,600		247	565	1,450	552	5
0082_MW131_4.0-4.5_210621	21/06/2021	MW131	EP2107024	188	<1	220	14.5	12.7	275	6.59	8.85	234	115	932		68	23	12	17	15
0082_MW132_8.5-9.0_210621	21/06/2021	MW132	EP2107024	166	<1	166	553	628	17,800	6.37	7.64	10,800	2,280	34,300		265	493	1,450	566	
0082_MW133_3.0-3.5_210621	21/06/2021	MW133	EP2107024	116	<1	116	11.9	9.44	315	11.6	8.04	143	35	734		1,020	32	16	12	4
0082_MW134_210621	21/06/2021	MW134	EP2107033	312	<1	312	429	514	13,800	8.94	7.57	8,920	1,630	30,500		156	598	1,050	374	4
0082_MW135_210621	21/06/2021	MW135	EP2107028	587	<1	587	252	271	7,000	3.50	7.87	5,200	2,080	16,000	10	22,800	125	398	220	
0082_MW137_8.1-8.6_210621	21/06/2021	MW137	EP2107024	373	<1	373	218	213	6,780	1.14	7.66	3,770	913	13,400		233	207	422	147	29
0082_MW142_210621	21/06/2021	MW142	EP2107028	303	<1	303	53.7	53.9	1,600	0.22	7.61	647	121	3,870		1,120	226	156	66	3
0082_MW143_210621	21/06/2021	MW143	EP2107028	401	<1	407	14.5	12.6	193	7.04	8.33	251	44	852		154	6	7	31	<1
0082_MW144S_210621	21/06/2021	MW144S	EP2107033	647	<1	647	30.8	27.8	539	5.19	8.12	592	129	1,740		300	12	8	30	2
0082_MW145_210621	21/06/2021	MW145	EP2107028	252	<1	252	567	654	18,100	7.05	7.66	11,500	2,490	34,500		995	603	1,320	570	<1
0082_MW147_210622	22/06/2021	MW147	EP2107183	306	<1	306	388	405	12,500	2.14	7.63	6,880	1,390	26,600		12,100	501	869	346	5
0082_MW148S_210621	21/06/2021	MW148S	EP2107033	333	<1	333	440	533	14,000	9.57	7.41	9,190	1,830	29,700		155	627	1,110	404	<1
0082_MW151S_210621	21/06/2021	MW151S	EP2107024	236	<1	236	589	704	18,900	8.87	7.42	12,100	2,480	39,400		696	605	1,590	660	1
0082_MW152S_210622	22/06/2021	MW152S	EP2107092	228	<1	228	562	612	18,100	4.23	7.54	10,600	2,260	37,600		161	527	1,320	618	3
0082_MW153S_210622	22/06/2021	MW153S	EP2107086	288	<1	288	534	572	17,200	3.52	7.52	9,870	2,050	35,400		1,300	539	1,240	560	3
0082_MW154S_210621	21/06/2021	MW154S	EP2107033	432	<1	432	295	287	9,350	1.51	7.53	4,950	1,110	15,700	7	1,310	319	591	266	
0082_MW155S_210621	21/06/2021	MW155S	EP2107024	462	<1	462	256	270	8,000	2.60	7.46	4,630	1,010	16,800		124	341	560	200	4
0082_MW310_210621	21/06/2021	MW310	EP2107028	660	<1	660	32.9	30.3	547	4.02	7.89	565	204	1,980		720	28	37	51	4
0082_MW311_210621	21/06/2021	MW311	EP2107028	227	<1	227	6.34	6.07	41	2.14	8.09	74	31	420		109	26	13	19	2
0082_MW315_210621	21/06/2021	MW315	EP2107033	666	<1	676	19.3	17.3	134	5.31	8.34	354	96	1,000		198	5	10	34	<2
0082_MW326_210621	21/06/2021	MW326	EP2107028	569	<1	569	402	472	12,300	8.08	7.62	8,570	2,080	24,600		482	369	882	333	7
0082_OTH101_210621	21/06/2021	OTH101	EP2107024	119	<1	119	580	643	18,700	5.16	7.59	11,100	2,420	38,800		210	473	1,480	591	5
0082_OTH102_210621	21/06/2021	OTH102	EP2107024	133	<1	133	584	649	18,800	5.24	7.72	11,200	2,460	35,000		2,190	476	1,490	594	3
0082_OTH103_210621	21/06/2021	OTH103	EP2107024	129	<1	129	595	611	19,000	1.32	7.94	10,500	2,730	37,000		35	457	1,420	581	2
0082_OTH104_210621	21/06/2021	OTH104	EP2107024	135	<1	135	583	696	18,700	8.78	7.95	12,000	2,550	39,400		34	514	1,600	638	2
0082_OTH105_210621	21/06/2021	OTH105	EP2107024	134	<1	134	597	690	19,200	7.22	7.88	11,900	2,520	40,000		39	505	1,590	626	1
0082_OTH106_210621	21/06/2021	OTH106	EP2107024	162	<1	162	596	713	19,200	8.92	7.63	12,300	2,480	40,000		35	530	1,640	658	7
0082_SW161_210621	21/06/2021	SW161	EP2107025	80	<1	80	103	107	3,210	1.98	7.79	1,840	530	6,810		<5	123	228	94	9
0082_SW162_210621	21/06/2021	SW162	EP2107025	89	<1	89	104	106	3,260	0.46	7.66	1,810	519	6,670		<5	119	224	94	9
0082_SW163_210621	21/06/2021	SW163	EP2107025	87	<1	87	111	111	3,460	0.05	7.76	1,900	546	6,890		<5	123	235	97	9
0082_SW181_210621	21/06/2021	SW181	EP2107025	172	<1	172	605	723	19,500	8.87	7.47	12,600	2,470	43,600		33	519	1,600	668	13

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,

	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)
	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
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																
0082_SD161_210621	21/06/2021	SS161	EP2107026	<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
0082_SD162_210621	21/06/2021	SS162	EP2107026	<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
0082_SD163_210621	21/06/2021	SD163	EP2107026	<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
0082_SD164_210621	21/06/2021	SS164	EP2107034	<0.0002	<0.0002	<0.0002	<0.0002	0.0034	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0005	<0.0002	<0.0002
0082_SD165_210621	21/06/2021	SS165	EP2107034	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002
0082_SD167_210621	21/06/2021	SS167	EP2107034	<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
0082_SD169_210621	21/06/2021	SS169	EP2107034	<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
0082_SD181_210621	21/06/2021	SD181	EP2107026	<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
0082_SS171_210621	21/06/2021	SS171	EP2107034	<0.0002	<0.0002	<0.0002	<0.0002	0.0056	0.0034	<0.001	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0005	0.0002	0.0003
0082_SS173_210621	21/06/2021	SS173	EP2107026	<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
0082_SS179_210621	21/06/2021	SS179	EP2107026	<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

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

	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	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium
	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
LOR - Limit of Reporting	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	0.1	0.1	0.1
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														
0082_SD161_210621	21/06/2021	SS161	EP2107026	<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	1.9	41.5	14.0
0082_SD162_210621	21/06/2021	SS162	EP2107026	<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	33.5	14.7
0082_SD163_210621	21/06/2021	SD163	EP2107026	<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	1.0	34.4	13.6
0082_SD164_210621	21/06/2021	SS164	EP2107034	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0034	0.0034	0.0037	0.7	4.8	3.7
0082_SD165_210621	21/06/2021	SS165	EP2107034	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0005	0.0005	0.0005	0.7	4.5	2.0
0082_SD167_210621	21/06/2021	SS167	EP2107034	<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	0.9	13.0	2.4
0082_SD169_210621	21/06/2021	SS169	EP2107034	<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	2.0	6.4
0082_SD181_210621	21/06/2021	SD181	EP2107026	<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	28.1	12.5
0082_SS171_210621	21/06/2021	SS171	EP2107034	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0056	0.0056	0.0098	1.1	16.2	4.0
0082_SS173_210621	21/06/2021	SS173	EP2107026	<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	4.3	6.9
0082_SS179_210621	21/06/2021	SS179	EP2107026	<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	9.2	4.2

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

	Inorganics						Organic
	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity *(lab)	pH (Lab)	Organic Matter
	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%
LOR - Limit of Reporting	0.1	0.1	0.1	0.1	1	0.1	0.5
PFAS NEMP 2020 Ecological direct exposure							
PFAS NEMP 2020 Ecological indirect exposure							
PFAS NEMP 2020 Industrial/ commercial (HIL D)							
Field ID	Date	Location Code	Lab Report Number				
0082_SD161_210621	21/06/2021	SS161	EP2107026	4.4	0.2	0.4	19.0	993	8.8	5.6
0082_SD162_210621	21/06/2021	SS162	EP2107026	3.3	0.1	0.3	18.4	786	9.3	4.1
0082_SD163_210621	21/06/2021	SD163	EP2107026	2.4	<0.1	0.2	16.2	715	9.4	4.0
0082_SD164_210621	21/06/2021	SS164	EP2107034	0.5	0.2	<0.1	4.4	38	8.8	1.5
0082_SD165_210621	21/06/2021	SS165	EP2107034	0.5	0.1	<0.1	2.6	14	7.6	0.5
0082_SD167_210621	21/06/2021	SS167	EP2107034	0.3	0.2	<0.1	2.9	33	8.0	1.3
0082_SD169_210621	21/06/2021	SS169	EP2107034	0.3	0.1	<0.1	6.8	41	9.2	1.3
0082_SD181_210621	21/06/2021	SD181	EP2107026	1.8	<0.1	0.2	14.6	3,480	8.8	4.2
0082_SS171_210621	21/06/2021	SS171	EP2107034	0.3	0.2	<0.1	4.5	44	8.8	1.2
0082_SS173_210621	21/06/2021	SS173	EP2107026	0.4	0.4	<0.1	7.8	60	8.9	1.6
0082_SS179_210621	21/06/2021	SS179	EP2107026	0.6	<0.1	<0.1	4.9	923	9.1	1.4

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)
	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				
Sample Code	Field ID	Date	Sample Type	Lab Report Number														
EP2107024016	0082_QC301_210621	21/06/2021	Rinsate	EP2107024	<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
EP2107024017	0082_QC302_210621	21/06/2021	Rinsate	EP2107024	<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
EP2107024018	0082_QC303_210621	21/06/2021	Rinsate	EP2107024	<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
EP2107024019	0082_QC401_210621	21/06/2021	Field Blank	EP2107024	<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
EP2107024020	0082_QC402_210621	21/06/2021	Field Blank	EP2107024	<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
EP2107024021	0082_QC403_210621	21/06/2021	Field Blank	EP2107024	<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
EP2107183003	0082_QC401_210622	22/06/2021	Field Blank	EP2107183	<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
EP2107183004	0082_QC301_210622	22/06/2021	Rinsate	EP2107183	<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
EP2107183005	0082_QC303_210622	22/06/2021	Rinsate	EP2107183	<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
EP2107183006	0082_QC402_210622	22/06/2021	Field Blank	EP2107183	<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
EP2107183007	0082_QC302_210622	22/06/2021	Rinsate	EP2107183	<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
EP2107183008	0082_QC403_210622	22/06/2021	Field Blank	EP2107183	<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

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Interim Marine 99%
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

			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	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	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	0.01
PFAS NEMP 2020 Interim Marine 99%																
PFAS NEMP 2020 Recreational Water															2	

Sample Code	Field ID	Date	Sample Type	Lab Report Number															
EP2107024016	0082_QC301_210621	21/06/2021	Rinsate	EP2107024	<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	<0.01
EP2107024017	0082_QC302_210621	21/06/2021	Rinsate	EP2107024	<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	<0.01
EP2107024018	0082_QC303_210621	21/06/2021	Rinsate	EP2107024	<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	<0.01
EP2107024019	0082_QC401_210621	21/06/2021	Field Blank	EP2107024	<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	<0.01
EP2107024020	0082_QC402_210621	21/06/2021	Field Blank	EP2107024	<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	<0.01
EP2107024021	0082_QC403_210621	21/06/2021	Field Blank	EP2107024	<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	<0.01
EP2107183003	0082_QC401_210622	22/06/2021	Field Blank	EP2107183	<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	<0.01
EP2107183004	0082_QC301_210622	22/06/2021	Rinsate	EP2107183	<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	<0.01
EP2107183005	0082_QC303_210622	22/06/2021	Rinsate	EP2107183	<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	<0.01
EP2107183006	0082_QC402_210622	22/06/2021	Field Blank	EP2107183	<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	<0.01
EP2107183007	0082_QC302_210622	22/06/2021	Rinsate	EP2107183	<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	<0.01
EP2107183008	0082_QC403_210622	22/06/2021	Field Blank	EP2107183	<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	<0.01

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Interim Marine 99%
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Field ID			0082_SW163_210621	0082_QC101_210621		0082_SW163_210621	0082_QC201_210621		0082_MW142_210621	0082_QC103_210621		0082_MW142_210621	0082_QC203_210621	
Date			21/06/2021	21/06/2021		21/06/2021	21/06/2021		21/06/2021	21/06/2021		21/06/2021	21/06/2021	
Matrix Type			Water	Water		Water	Water		Water	Water		Water	Water	
Lab Report Number			EP2107025	EP2107025	RPD	EP2107025	805490	RPD	EP2107028	EP2107028	RPD	EP2107028	805490	RPD
	Unit	LOR												
PFAS - Perfluoroalkyl Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01					<0.01						0.28	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.42	0.24	55	0.42	0.46	9
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.46	0.27	52	0.46	0.51	10
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	3.27	2.00	48	3.27	3.6	10
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	1.07	0.48	76	1.07	0.63	52
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	48.6	27.3	56	48.6	60	21
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	1.7	1.0	52	1.7	2.2	26
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	3.47	1.99	54	3.47	4.1	17
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	4.47	2.36	62	4.47	4.6	3
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	1.28	0.76	51	1.28	1.6	22
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	0.74	0.46	47	0.74	0.78	5
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	0.16	0.09	56	0.16	0.15	6
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	4.74	3.15	40	4.74	4.7	1
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	0.02	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	1.8	189
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	0.11	75
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	0.16	156
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	0.07	33
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	0.17	109
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	0.33	177
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	0.10	67
PFAS														
Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.05	0	68.7	39.3	54	68.7	82.06	18
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	51.9	29.3	56	51.9	63.6	20
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.1	0	70.4	40.1	55	70.4	86.37	20
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					<0.01						64.38	
Metals														
Calcium	mg/L	0.5					130						140	
Calcium (filtered)	mg/L	0.5	123	122	1	123			226	182	22	226		
Magnesium	mg/L	0.5					250						140	
Magnesium (filtered)	mg/L	0.5	235	234	0	235			156	156	0	156		
Potassium	mg/L	0.5					87						48	
Potassium (filtered)	mg/L	0.5	97	93	4	97			66	66	0	66		
Organic														
Dissolved Organic Carbon	mg/L	1	9	10	11	9			3	3	0	3		

*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			0082_MW103D_210621	0082_QC104_210621		0082_MW103D_210621	0082_QC204_210621		0082_MW145_210621	0082_QC106_210621		0082_MW145_210621	0082_QC206_210621	
Date			21/06/2021	21/06/2021		21/06/2021	21/06/2021		21/06/2021	21/06/2021		21/06/2021	21/06/2021	
Matrix Type			Water	Water		Water	Water		Water	Water		Water	Water	
Lab Report Number			EP2107028	EP2107028	RPD	EP2107028	805490	RPD	EP2107028	EP2107028	RPD	EP2107028	805490	RPD
	Unit	LOR												
PFAS - Perfluoroalkyl Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01					0.13						<0.01	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.27	0.26	4	0.27	0.26	4	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.37	0.36	3	0.37	0.32	14	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	2.82	2.76	2	2.82	2.7	4	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.13	0.13	0	0.13	0.06	74	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	2.64	2.87	8	2.64	2.9	9	<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	0.18	57	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.74	0.74	0	0.74	0.67	10	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.21	0.21	0	0.21	0.18	15	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.07	0.07	0	0.07	0.07	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.08	0.08	0	0.08	0.06	29	<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	6.83	6.99	2	6.83	7.02	3	<0.01	<0.01	0	<0.01	<0.05	0
Sum of PFHxS and PFOS	µg/L	0.01	5.46	5.63	3	5.46	5.6	3	<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS	µg/L	0.01	7.33	7.48	2	7.33	7.53	3	<0.01	<0.01	0	<0.01	<0.1	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					5.66						<0.01	
Metals														
Calcium	mg/L	0.5					230						550	
Calcium (filtered)	mg/L	0.5	337	315	7	337			603	613	2	603		
Magnesium	mg/L	0.5					170						1,100	
Magnesium (filtered)	mg/L	0.5	200	186	7	200			1,320	1,340	2	1,320		
Potassium	mg/L	0.5					21						390	
Potassium (filtered)	mg/L	0.5	37	34	8	37			570	583	2	570		
Organic														
Dissolved Organic Carbon	mg/L	1	<1	<1	0	<1			<1	2	67	<1		

		Field ID	0082_MW147_210622	0082_QC107_210622		0082_MW147_210622	0082_QC207_210622	
		Date	22/06/2021	22/06/2021		22/06/2021	22/06/2021	
		Matrix Type	Water	Water		Water	Water	
		Lab Report Number	EP2107183	EP2107183	RPD	EP2107183	805490	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
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	
Metals								
Calcium	mg/L	0.5					420	
Calcium (filtered)	mg/L	0.5	501	517	3	501		
Magnesium	mg/L	0.5					760	
Magnesium (filtered)	mg/L	0.5	869	897	3	869		
Potassium	mg/L	0.5					220	
Potassium (filtered)	mg/L	0.5	346	353	2	346		
Organic								
Dissolved Organic Carbon	mg/L	1	5	5	0	5		

Field ID			0082_SD163_210621	0082_QC102_210621		0082_SD163_210621	0082_QC202_210621		0082_SD164_210621	0082_QC105_210621		0082_SD164_210621	0082_QC205_210621	
Date			21/06/2021	21/06/2021		21/06/2021	21/06/2021		21/06/2021	21/06/2021		21/06/2021	21/06/2021	
Matrix Type			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
Lab Report Number			EP2107026	EP2107026	RPD	EP2107026	805490	RPD	EP2107034	EP2107034	RPD	EP2107034	805490	RPD
	Unit	LOR												
PFAS - Perfluoroalkyl Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005					<0.005						<0.005	
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<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	<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	<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	<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	0.0034	0.0047	32	0.0034	<0.005	0
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005					<0.005						<0.005	
Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<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	<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	<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	<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	<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	<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	<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	<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	0.0003	0.0004	29	0.0003	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<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	<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	<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	<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	<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	<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	<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	<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	<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	<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	<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	<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	<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	<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	0.0034	0.0047	32	0.0034	<0.01	0
Sum of PFHxS and PFOS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0034	0.0047	32	0.0034	<0.005	0
Sum of PFAS	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.05	0	0.0037	0.0051	32	0.0037	<0.05	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	0.005					<0.005						<0.005	
Organic														
Organic Matter	%	0.5	4.0	3.7	8	4.0			1.5	1.5	0	1.5		

*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#: 24378 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

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: 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: 23/6/21	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	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_OTH101		21/06/2021 07:58 AM	Water	ALS: 5 Non ALS: 0	No	X				
002	0082_OTH102		21/06/2021 09:31 AM	Water	ALS: 5 Non ALS: 0	No	X				
003	0082_MW128_3.7-4.2		21/06/2021 11:16 AM	Water	ALS: 7 Non ALS: 0	No	X		X		Extra PFAS bottles for lab QC
004	0082_MW151S		21/06/2021 11:38 AM	Water	ALS: 5 Non ALS: 0	No	X				
005	0082_MW129_3.5-4.0		21/06/2021 12:00 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8				
006	0082_MW130_6.9-7.4		21/06/2021 12:21 PM	Water	ALS: 5 Non ALS: 0	No	X				
007	0082_OTH103		21/06/2021 12:40 PM	Water	ALS: 5 Non ALS: 0	No	X				
008	0082_MW131_4.0-4.5		21/06/2021 01:09 PM	Water	ALS: 5 Non ALS: 0	No	X				
009	0082_OTH104		21/06/2021 01:25 PM	Water	ALS: 5 Non ALS: 0	No	X				

Environmental Division
Perth
Work Order Reference
EP2107024

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

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PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

ORDER NO: DEF19009/0082

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RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: MD 10am 23/6/21	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	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0082_OTH105		21/06/2021 01:40 PM	Water	ALS: 5 Non ALS: 0	No	X				
011	0082_MW132_8.5-9.0		21/06/2021 02:03 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8				
012	0082_OTH106		21/06/2021 02:18 PM	Water	ALS: 3 Non ALS: 0	No	X				
013	0082_MW155S		21/06/2021 02:57 PM	Water	ALS: 5 Non ALS: 0	No	X				Extra PFAS bottles for lab QC
014	0082_MW137_8.1-8.6		21/06/2021 03:17 PM	Water	ALS: 3 Non ALS: 0	No	X				
015	0082_MW133_3.0-3.5		21/06/2021 03:47 PM	Water	ALS: 7 Non ALS: 0	No	X				extra PFAS bottles for lab QC
016	0082_QC301		21/06/2021 04:54 PM	Water	ALS: 2 Non ALS: 0	No		X			
017	0082_QC302		21/06/2021 04:55 PM	Water	ALS: 2 Non ALS: 0	No		X			
018	0082_QC303		21/06/2021 04:59 PM	Water	ALS: 2 Non ALS: 0	No		X			

CHAIN OF CUSTODY

COC#: 24378 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: ND 10am 23/6/21	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

ORDER NO: DEF19009/0082

PROJECT MANAGER: Maelle Bourdais
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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

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
019	0082_QC401		21/06/2021 05:01 PM	Water	ALS: 2 Non ALS: 0	No		X			
020	0082_QC402		21/06/2021 05:01 PM	Water	ALS: 2 Non ALS: 0	No		X			
021	0082_QC403		21/06/2021 05:02 PM	Water	ALS: 2 Non ALS: 0	No		X			

CHAIN OF CUSTODY

(ALS) COC#: **24378** *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/HEHB GW

ORDER NO: DEF19009/0082

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

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	0082_MW129_3.5-4.0	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)
011	0082_MW132_8.5-9.0	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#: 24378 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

ORDER NO: DEF19009/0082

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	0082_OTH101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002628	Purple	No	
001	0082_OTH101	Clear Plastic Bottle - Natural	250 mL	00070220186722	Green	No	
001	0082_OTH101	Clear Plastic Bottle - Natural	250 mL	00070220186606	Green	No	
001	0082_OTH101	HDPE (no PTFE)	20 mL	00352005019541	Grey	No	
001	0082_OTH101	HDPE (no PTFE)	20 mL	00352005019785	Grey	No	
002	0082_OTH102	Clear Plastic Bottle - Natural	250 mL	00070220186418	Green	No	
002	0082_OTH102	Clear Plastic Bottle - Natural	250 mL	00070220186582	Green	No	
002	0082_OTH102	HDPE (no PTFE)	20 mL	00352005019578	Grey	No	
002	0082_OTH102	HDPE (no PTFE)	20 mL	00352005019829	Grey	No	
002	0082_OTH102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003908	Purple	No	
003	0082_MW128_3.7-4.2	Clear Plastic Bottle - Natural	250 mL	00070220186050	Green	No	
003	0082_MW128_3.7-4.2	Clear Plastic Bottle - Natural	250 mL	00070220186587	Green	No	
003	0082_MW128_3.7-4.2	HDPE (no PTFE)	20 mL	00350019164100	Grey	No	
003	0082_MW128_3.7-4.2	HDPE (no PTFE)	20 mL	00350019163879	Grey	No	
003	0082_MW128_3.7-4.2	HDPE (no PTFE)	20 mL	00350019164396	Grey	No	
003	0082_MW128_3.7-4.2	HDPE (no PTFE)	20 mL	00352010039943	Grey	No	
003	0082_MW128_3.7-4.2	Amber TOC Vial - Sulfuric Acid	40 mL	00181020002493	Purple	No	
004	0082_MW151S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002602	Purple	No	
004	0082_MW151S	Clear Plastic Bottle - Natural	250 mL	00070220186581	Green	No	
004	0082_MW151S	Clear Plastic Bottle - Natural	250 mL	00070220186715	Green	No	
004	0082_MW151S	HDPE (no PTFE)	20 mL	00352005019358	Grey	No	
004	0082_MW151S	HDPE (no PTFE)	20 mL	00352005019647	Grey	No	
005	0082_MW129_3.5-4.0	HDPE (no PTFE)	20 mL	00352005019426	Grey	No	
005	0082_MW129_3.5-4.0	HDPE (no PTFE)	20 mL	00352005019585	Grey	No	
005	0082_MW129_3.5-4.0	Clear Plastic Bottle - Natural	250 mL	00070220186702	Green	No	
005	0082_MW129_3.5-4.0	Clear Plastic Bottle - Natural	250 mL	00070220186617	Green	No	

CHAIN OF CUSTODY

ALS COC#: 24378 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/HEHB GW

ORDER NO: DEF19009/0082

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	0082_MW130_6.9-7.4	HDPE (no PTFE)	20 mL	00352010040110	Grey	No	
006	0082_MW130_6.9-7.4	HDPE (no PTFE)	20 mL	00352005019815	Grey	No	
006	0082_MW130_6.9-7.4	Clear Plastic Bottle - Natural	250 mL	00070220186501	Green	No	
006	0082_MW130_6.9-7.4	Clear Plastic Bottle - Natural	250 mL	00070220186700	Green	No	
006	0082_MW130_6.9-7.4	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002601	Purple	No	
007	0082_OTH103	HDPE (no PTFE)	20 mL	00352005019759	Grey	No	
007	0082_OTH103	Clear Plastic Bottle - Natural	250 mL	00070220186557	Green	No	
007	0082_OTH103	HDPE (no PTFE)	20 mL	00352005019839	Grey	No	
007	0082_OTH103	Clear Plastic Bottle - Natural	250 mL	00070220186493	Green	No	
007	0082_OTH103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002611	Purple	No	
008	0082_MW131_4.0-4.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020004150	Purple	No	
008	0082_MW131_4.0-4.5	Clear Plastic Bottle - Natural	250 mL	00070220186636	Green	No	
008	0082_MW131_4.0-4.5	Clear Plastic Bottle - Natural	250 mL	00070220186685	Green	No	
008	0082_MW131_4.0-4.5	HDPE (no PTFE)	20 mL	00352005019914	Grey	No	
008	0082_MW131_4.0-4.5	HDPE (no PTFE)	20 mL	00352010040295	Grey	No	
009	0082_OTH104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002724	Purple	No	
009	0082_OTH104	Clear Plastic Bottle - Natural	250 mL	00070220186564	Green	No	
009	0082_OTH104	Clear Plastic Bottle - Natural	250 mL	00070220186043	Green	No	
009	0082_OTH104	HDPE (no PTFE)	20 mL	00352005019834	Grey	No	
009	0082_OTH104	HDPE (no PTFE)	20 mL	00352005019339	Grey	No	
010	0082_OTH105	HDPE (no PTFE)	20 mL	00352005019850	Grey	No	
010	0082_OTH105	Clear Plastic Bottle - Natural	250 mL	00070220186373	Green	No	
010	0082_OTH105	HDPE (no PTFE)	20 mL	00352005019877	Grey	No	
010	0082_OTH105	Clear Plastic Bottle - Natural	250 mL	00070220186721	Green	No	
010	0082_OTH105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002726	Purple	No	
011	0082_MW132_8.5-9.0	Clear Plastic Bottle - Natural	250 mL	00070220186708	Green	No	
011	0082_MW132_8.5-9.0	Clear Plastic Bottle - Natural	250 mL	00070220186707	Green	No	

CHAIN OF CUSTODY

ALS COC#: 24378 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

ORDER NO: DEF19009/0082

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

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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:

011	0082_MW132_8.5-9.0	HDPE (no PTFE)	20 mL	00352005019316	Grey	No	
011	0082_MW132_8.5-9.0	HDPE (no PTFE)	20 mL	00352005019574	Grey	No	
012	0082_OTH106	Clear Plastic Bottle - Natural	250 mL	00070519189705	Green	No	
012	0082_OTH106	HDPE (no PTFE)	20 mL	00350719049205	Grey	No	
012	0082_OTH106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016557	Purple	No	
013	0082_MW155S	Clear Plastic Bottle - Natural	250 mL	00070519189661	Green	No	
013	0082_MW155S	HDPE (no PTFE)	20 mL	00350719049015	Grey	No	
013	0082_MW155S	HDPE (no PTFE)	20 mL	00350019025442	Grey	No	
013	0082_MW155S	HDPE (no PTFE)	20 mL	00350019047397	Grey	No	
013	0082_MW155S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016512	Purple	No	
014	0082_MW137_8.1-8.6	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016486	Purple	No	
014	0082_MW137_8.1-8.6	Clear Plastic Bottle - Natural	250 mL	00070519189646	Green	No	
014	0082_MW137_8.1-8.6	HDPE (no PTFE)	20 mL	00350719049012	Grey	No	
015	0082_MW133_3.0-3.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002596	Purple	No	
015	0082_MW133_3.0-3.5	Clear Plastic Bottle - Natural	250 mL	00070220186716	Green	No	
015	0082_MW133_3.0-3.5	Clear Plastic Bottle - Natural	250 mL	00070220186638	Green	No	
015	0082_MW133_3.0-3.5	HDPE (no PTFE)	20 mL	00350019047442	Grey	No	
015	0082_MW133_3.0-3.5	HDPE (no PTFE)	20 mL	00350019047351	Grey	No	
015	0082_MW133_3.0-3.5	HDPE (no PTFE)	20 mL	00352005019459	Grey	No	
015	0082_MW133_3.0-3.5	HDPE (no PTFE)	20 mL	00352005019727	Grey	No	
016	0082_QC301	HDPE (no PTFE)	20 mL	00352010059002	Grey	No	
016	0082_QC301	HDPE (no PTFE)	20 mL	00352010059150	Grey	No	
017	0082_QC302	HDPE (no PTFE)	20 mL	00352010058887	Grey	No	
017	0082_QC302	HDPE (no PTFE)	20 mL	00352010059075	Grey	No	
018	0082_QC303	HDPE (no PTFE)	20 mL	00352010058972	Grey	No	
018	0082_QC303	HDPE (no PTFE)	20 mL	00352010059000	Grey	No	
019	0082_QC401	HDPE (no PTFE)	20 mL	00352010059051	Grey	No	

CHAIN OF CUSTODY

COC#: **24378** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

ORDER NO: DEF19009/0082

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE: / ES2019CARBSD0002

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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	0082_QC401	HDPE (no PTFE)	20 mL	00352010059159	Grey	No	
020	0082_QC402	HDPE (no PTFE)	20 mL	00352010058590	Grey	No	
020	0082_QC402	HDPE (no PTFE)	20 mL	00352010059050	Grey	No	
021	0082_QC403	HDPE (no PTFE)	20 mL	00352010058922	Grey	No	
021	0082_QC403	HDPE (no PTFE)	20 mL	00352010058938	Grey	No	

Total Bottle Count: ALS: 85, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107024**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24378	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 23-Jun-2021 10:00	Issue Date	: 24-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	: 9.4 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 21 / 21

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
- 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.
- **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.

EP2107024-003	: 21-Jun-2021 11:16	: 0082_MW128_3.7-4.2_210621
EP2107024-005	: 21-Jun-2021 12:00	: 0082_MW129_3.5-4.0_210621
EP2107024-006	: 21-Jun-2021 12:21	: 0082_MW130_6.9-7.4_210621
EP2107024-008	: 21-Jun-2021 13:09	: 0082_MW131_4.0-4.5_210621
EP2107024-011	: 21-Jun-2021 14:03	: 0082_MW132_8.5-9.0_210621
EP2107024-014	: 21-Jun-2021 15:17	: 0082_MW137_8.1-8.6_210621
EP2107024-015	: 21-Jun-2021 15:47	: 0082_MW133_3.0-3.5_210621

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)
EP2107024-001	21-Jun-2021 07:58	0082_OTH101_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-002	21-Jun-2021 09:31	0082_OTH102_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-003	21-Jun-2021 11:16	0082_MW128_3.7-4.2_2...	✓	✓	✓	✓		✓	✓
EP2107024-004	21-Jun-2021 11:38	0082_MW151S_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-005	21-Jun-2021 12:00	0082_MW129_3.5-4.0_2...	✓	✓	✓	✓		✓	✓
EP2107024-006	21-Jun-2021 12:21	0082_MW130_6.9-7.4_2...	✓	✓	✓	✓	✓	✓	✓
EP2107024-007	21-Jun-2021 12:40	0082_OTH103_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-008	21-Jun-2021 13:09	0082_MW131_4.0-4.5_2...	✓	✓	✓	✓	✓	✓	✓
EP2107024-009	21-Jun-2021 13:25	0082_OTH104_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-010	21-Jun-2021 13:40	0082_OTH105_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-011	21-Jun-2021 14:03	0082_MW132_8.5-9.0_2...	✓	✓	✓	✓		✓	✓
EP2107024-012	21-Jun-2021 14:18	0082_OTH106_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-013	21-Jun-2021 14:57	0082_MW155S_210621	✓	✓	✓	✓	✓	✓	✓
EP2107024-014	21-Jun-2021 15:17	0082_MW137_8.1-8.6_2...	✓	✓	✓	✓	✓	✓	✓
EP2107024-015	21-Jun-2021 15:47	0082_MW133_3.0-3.5_2...	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107024-001	21-Jun-2021 07:58	0082_OTH101_210621		✓
EP2107024-002	21-Jun-2021 09:31	0082_OTH102_210621		✓
EP2107024-003	21-Jun-2021 11:16	0082_MW128_3.7-4.2_2...	✓	✓
EP2107024-004	21-Jun-2021 11:38	0082_MW151S_210621		✓
EP2107024-005	21-Jun-2021 12:00	0082_MW129_3.5-4.0_2...		✓
EP2107024-006	21-Jun-2021 12:21	0082_MW130_6.9-7.4_2...		✓
EP2107024-007	21-Jun-2021 12:40	0082_OTH103_210621		✓
EP2107024-008	21-Jun-2021 13:09	0082_MW131_4.0-4.5_2...		✓
EP2107024-009	21-Jun-2021 13:25	0082_OTH104_210621		✓
EP2107024-010	21-Jun-2021 13:40	0082_OTH105_210621		✓
EP2107024-011	21-Jun-2021 14:03	0082_MW132_8.5-9.0_2...		✓
EP2107024-012	21-Jun-2021 14:18	0082_OTH106_210621		✓
EP2107024-013	21-Jun-2021 14:57	0082_MW155S_210621		✓
EP2107024-014	21-Jun-2021 15:17	0082_MW137_8.1-8.6_2...		✓
EP2107024-015	21-Jun-2021 15:47	0082_MW133_3.0-3.5_2...		✓
EP2107024-016	21-Jun-2021 16:54	0082_QC301_210621		✓
EP2107024-017	21-Jun-2021 16:55	0082_QC302_210621		✓
EP2107024-018	21-Jun-2021 16:59	0082_QC303_210621		✓
EP2107024-019	21-Jun-2021 17:01	0082_QC401_210621		✓
EP2107024-020	21-Jun-2021 17:01	0082_QC402_210621		✓
EP2107024-021	21-Jun-2021 17:02	0082_QC403_210621		✓

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_MW128_3.7-4.2	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW129_3.5-4.0	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW130_6.9-7.4	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW131_4.0-4.5	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW132_8.5-9.0	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW133_3.0-3.5	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW137_8.1-8.6	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW151S_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW155S_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_OTH101_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_OTH102_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_OTH103_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_OTH104_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_OTH105_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_OTH106_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-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	: **EP2107024**	Page	: 1 of 17
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	: 23-Jun-2021 10:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 24-Jun-2021
C-O-C number	: 24378	Issue Date	: 05-Jul-2021 18:53
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 21		
No. of samples analysed	: 21		

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.

- 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 #15 due to analytes not quantified in this report.
- 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_MW128_3.7-4.2_210621	0082_MW151S_210621	0082_MW129_3.5-4.0_210621	0082_MW130_6.9-7.4_210621	0082_MW131_4.0-4.5_210621
				Sampling date / time	21-Jun-2021 11:16	21-Jun-2021 11:38	21-Jun-2021 12:00	21-Jun-2021 12:21	21-Jun-2021 13:09
Compound	CAS Number	LOR	Unit		EP2107024-003	EP2107024-004	EP2107024-005	EP2107024-006	EP2107024-008
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.51	7.42	7.73	7.65	8.85
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		39900	39400	40500	36600	932
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		57700	696	213	247	68
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	32
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		220	236	157	185	188
Total Alkalinity as CaCO3	----	1	mg/L		220	236	157	185	220
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2540	2480	2520	2280	115
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19500	18900	19400	18000	275
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		588	605	537	565	23
Magnesium	7439-95-4	1	mg/L		1610	1590	1590	1450	12
Sodium	7440-23-5	1	mg/L		12500	12100	12000	11200	234
Potassium	7440-09-7	1	mg/L		664	660	641	552	17
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		607	589	603	559	14.5
ø Total Cations	----	0.01	meq/L		722	704	696	649	12.7
ø Ionic Balance	----	0.01	%		8.66	8.87	7.17	7.44	6.59
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	1	----	5	15
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		32	----	----	----	----
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_MW128_3.7-4.2_210621	0082_MW151S_210621	0082_MW129_3.5-4.0_210621	0082_MW130_6.9-7.4_210621	0082_MW131_4.0-4.5_210621
				Sampling date / time	21-Jun-2021 11:16	21-Jun-2021 11:38	21-Jun-2021 12:00	21-Jun-2021 12:21	21-Jun-2021 13:09
					EP2107024-003	EP2107024-004	EP2107024-005	EP2107024-006	EP2107024-008
					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	**0.02**	<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**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_MW128_3.7-4.2_210621	0082_MW151S_210621	0082_MW129_3.5-4.0_210621	0082_MW130_6.9-7.4_210621	0082_MW131_4.0-4.5_210621
				Sampling date / time	21-Jun-2021 11:16	21-Jun-2021 11:38	21-Jun-2021 12:00	21-Jun-2021 12:21	21-Jun-2021 13:09
					EP2107024-003	EP2107024-004	EP2107024-005	EP2107024-006	EP2107024-008
					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	**0.02**	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	**0.02**	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	**0.02**	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**102**	**97.3**	**103**	**102**	**102**
13C8-PFOA	----	0.02	%		**100**	**96.5**	**98.8**	**95.6**	**95.0**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW132_8.5-9.0_210621	0082_MW155S_210621	0082_MW137_8.1-8.6_210621	0082_MW133_3.0-3.5_210621	----
				Sampling date / time	21-Jun-2021 14:03	21-Jun-2021 14:57	21-Jun-2021 15:17	21-Jun-2021 15:47	----
Compound	CAS Number	LOR	Unit		EP2107024-011	EP2107024-013	EP2107024-014	EP2107024-015	--------
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.64	7.46	7.66	8.04	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		34300	16800	13400	734	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		265	124	233	1020	----
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		166	462	373	116	----
Total Alkalinity as CaCO3	----	1	mg/L		166	462	373	116	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2280	1010	913	35	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		17800	8000	6780	315	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		493	341	207	32	----
Magnesium	7439-95-4	1	mg/L		1450	560	422	16	----
Sodium	7440-23-5	1	mg/L		10800	4630	3770	143	----
Potassium	7440-09-7	1	mg/L		566	200	147	12	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		553	256	218	11.9	----
ø Total Cations	----	0.01	meq/L		628	270	213	9.44	----
ø Ionic Balance	----	0.01	%		6.37	2.60	1.14	11.6	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	4	29	4	----
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	0082_MW132_8.5-9.0_210621	0082_MW155S_210621	0082_MW137_8.1-8.6_210621	0082_MW133_3.0-3.5_210621	----
				Sampling date / time	21-Jun-2021 14:03	21-Jun-2021 14:57	21-Jun-2021 15:17	21-Jun-2021 15:47	----
Compound	CAS Number	LOR	Unit		EP2107024-011	EP2107024-013	EP2107024-014	EP2107024-015	--------
					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	0082_MW132_8.5-9.0_210621	0082_MW155S_210621	0082_MW137_8.1-8.6_210621	0082_MW133_3.0-3.5_210621	----
				Sampling date / time	21-Jun-2021 14:03	21-Jun-2021 14:57	21-Jun-2021 15:17	21-Jun-2021 15:47	----
Compound	CAS Number	LOR	Unit		EP2107024-011	EP2107024-013	EP2107024-014	EP2107024-015	--------
					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	%		**101**	**103**	**98.2**	**84.4**	----
13C8-PFOA	----	0.02	%		**94.6**	**98.7**	**96.1**	**84.4**	----

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	0082_OTH101_210621	0082_OTH102_210621	0082_OTH103_210621	0082_OTH104_210621	0082_OTH105_210621
				Sampling date / time	21-Jun-2021 07:58	21-Jun-2021 09:31	21-Jun-2021 12:40	21-Jun-2021 13:25	21-Jun-2021 13:40
					EP2107024-001	EP2107024-002	EP2107024-007	EP2107024-009	EP2107024-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.59**	**7.72**	**7.94**	**7.95**	**7.88**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**38800**	**35000**	**37000**	**39400**	**40000**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**210**	**2190**	**35**	**34**	**39**
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**	**133**	**129**	**135**	**134**
Total Alkalinity as CaCO3	----	1	mg/L		**119**	**133**	**129**	**135**	**134**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**2420**	**2460**	**2730**	**2550**	**2520**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**18700**	**18800**	**19000**	**18700**	**19200**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**473**	**476**	**457**	**514**	**505**
Magnesium	7439-95-4	1	mg/L		**1480**	**1490**	**1420**	**1600**	**1590**
Sodium	7440-23-5	1	mg/L		**11100**	**11200**	**10500**	**12000**	**11900**
Potassium	7440-09-7	1	mg/L		**591**	**594**	**581**	**638**	**626**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**580**	**584**	**595**	**583**	**597**
ø Total Cations	----	0.01	meq/L		**643**	**649**	**611**	**696**	**690**
ø Ionic Balance	----	0.01	%		**5.16**	**5.24**	**1.32**	**8.78**	**7.22**
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**5**	**3**	**2**	**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: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_OTH101_210621	0082_OTH102_210621	0082_OTH103_210621	0082_OTH104_210621	0082_OTH105_210621
				Sampling date / time	21-Jun-2021 07:58	21-Jun-2021 09:31	21-Jun-2021 12:40	21-Jun-2021 13:25	21-Jun-2021 13:40
					EP2107024-001	EP2107024-002	EP2107024-007	EP2107024-009	EP2107024-010
					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: WATER (Matrix: WATER)				Sample ID	0082_OTH101_210621	0082_OTH102_210621	0082_OTH103_210621	0082_OTH104_210621	0082_OTH105_210621
				Sampling date / time	21-Jun-2021 07:58	21-Jun-2021 09:31	21-Jun-2021 12:40	21-Jun-2021 13:25	21-Jun-2021 13:40
Compound	CAS Number	LOR	Unit		EP2107024-001	EP2107024-002	EP2107024-007	EP2107024-009	EP2107024-010
					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	%		**100**	**101**	**99.8**	**99.0**	**104**
13C8-PFOA	----	0.02	%		**102**	**106**	**96.3**	**95.7**	**98.0**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	0082_OTH106_210621	0082_QC301_210621	0082_QC302_210621	0082_QC303_210621	0082_QC401_210621
				Sampling date / time	21-Jun-2021 14:18	21-Jun-2021 16:54	21-Jun-2021 16:55	21-Jun-2021 16:59	21-Jun-2021 17:01
					EP2107024-012	EP2107024-016	EP2107024-017	EP2107024-018	EP2107024-019
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**7.63**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**40000**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**35**	----	----	----	----
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		**162**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**162**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**2480**	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**19200**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**530**	----	----	----	----
Magnesium	7439-95-4	1	mg/L		**1640**	----	----	----	----
Sodium	7440-23-5	1	mg/L		**12300**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**658**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**596**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**713**	----	----	----	----
ø Ionic Balance	----	0.01	%		**8.92**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		**7**	----	----	----	----
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)				Sample ID	0082_OTH106_210621	0082_QC301_210621	0082_QC302_210621	0082_QC303_210621	0082_QC401_210621
				Sampling date / time	21-Jun-2021 14:18	21-Jun-2021 16:54	21-Jun-2021 16:55	21-Jun-2021 16:59	21-Jun-2021 17:01
Compound	CAS Number	LOR	Unit		EP2107024-012	EP2107024-016	EP2107024-017	EP2107024-018	EP2107024-019
					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)			Sample ID	0082_OTH106_210621	0082_QC301_210621	0082_QC302_210621	0082_QC303_210621	0082_QC401_210621
			Sampling date / time	21-Jun-2021 14:18	21-Jun-2021 16:54	21-Jun-2021 16:55	21-Jun-2021 16:59	21-Jun-2021 17:01
Compound	CAS Number	LOR	Unit	EP2107024-012	EP2107024-016	EP2107024-017	EP2107024-018	EP2107024-019
				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	%	**98.3**	**81.8**	**82.9**	**82.7**	**83.8**
13C8-PFOA	----	0.02	%	**99.3**	**86.8**	**85.1**	**84.6**	**86.3**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0082_QC402_210621	0082_QC403_210621	----	----	----
				Sampling date / time	21-Jun-2021 17:01	21-Jun-2021 17:02	----	----	----
Compound	CAS Number	LOR	Unit		EP2107024-020	EP2107024-021	--------	--------	--------
					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	0082_QC402_210621	0082_QC403_210621	----	----	----
				Sampling date / time	21-Jun-2021 17:01	21-Jun-2021 17:02	----	----	----
Compound	CAS Number	LOR	Unit		EP2107024-020	EP2107024-021	--------	--------	--------
					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	%		**78.7**	**80.2**	----	----	----
13C8-PFOA	----	0.02	%		**85.8**	**86.0**	----	----	----

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	: **EP2107024**	Page	: 1 of 11
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	: 23-Jun-2021
Order number	: DEF19009/0082	Date Analysis Commenced	: 24-Jun-2021
C-O-C number	: 24378	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 21		
No. of samples analysed	: 21		

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 (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3768222)									
EP2107024-002	0082_OTH102_210621	EA005-P: pH Value	----	0.01	pH Unit	7.72	7.70	0.3	0% - 20%
EP2107024-012	0082_OTH106_210621	EA005-P: pH Value	----	0.01	pH Unit	7.63	7.63	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3756832)									
EP2107004-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6290	6300	0.2	0% - 20%
EP2107024-008	0082_MW131_4.0-4.5_210621	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	932	928	0.4	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3756833)									
EP2107024-001	0082_OTH101_210621	EA025H: Suspended Solids (SS)	----	5	mg/L	210	210	0.0	0% - 20%
EP2107024-011	0082_MW132_8.5-9.0_210621	EA025H: Suspended Solids (SS)	----	5	mg/L	265	287	8.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3768221)									
EP2107024-002	0082_OTH102_210621	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	133	128	4.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	133	128	4.4	0% - 20%
EP2107024-012	0082_OTH106_210621	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	162	151	6.9	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	162	151	6.9	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3754890)									
EP2107024-001	0082_OTH101_210621	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2420	2430	0.4	0% - 20%
EP2107024-011	0082_MW132_8.5-9.0_210621	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2280	2270	0.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3754891)									

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 (%)
ED045G: Chloride by Discrete Analyser (QC Lot: 3754891) - continued									
EP2107024-001	0082_OTH101_210621	ED045G: Chloride	16887-00-6	1	mg/L	18700	18500	1.3	0% - 20%
EP2107024-011	0082_MW132_8.5-9.0_210621	ED045G: Chloride	16887-00-6	1	mg/L	17800	17900	0.2	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3757366)									
EP2107024-001	0082_OTH101_210621	ED093F: Calcium	7440-70-2	1	mg/L	473	485	2.5	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1480	1530	2.9	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11100	11400	2.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	591	607	2.6	0% - 20%
EP2107024-011	0082_MW132_8.5-9.0_210621	ED093F: Calcium	7440-70-2	1	mg/L	493	523	5.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1450	1530	5.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10800	11500	6.2	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	566	603	6.3	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3755453)									
EP2107024-001	0082_OTH101_210621	EP002: Dissolved Organic Carbon	----	1	mg/L	5	4	33.3	No Limit
EP2107024-014	0082_MW137_8.1-8.6_210621	EP002: Dissolved Organic Carbon	----	1	mg/L	29	27	6.6	0% - 50%
EP005: Total Organic Carbon (TOC) (QC Lot: 3755451)									
EP2107024-003	0082_MW128_3.7-4.2_210621	EP005: Total Organic Carbon	----	1	mg/L	32	21	38.7	No Limit
EP2107173-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768158)									
EP2107024-003	0082_MW128_3.7-4.2_210621	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.03	100	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
ES2124088-010	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.48	0.56	15.3	0% - 20%
		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	0.14	0.16	13.7	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
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768172)									
EP2107024-015	0082_MW133_3.0-3.5_210621	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: 3768172) - continued									
EP2107024-015	0082_MW133_3.0-3.5_210621	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: 3768158)									
EP2107024-003	0082_MW128_3.7-4.2_210621	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
ES2124088-010	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	0.02	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	0.06	0.07	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
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3768172)									
EP2107024-015	0082_MW133_3.0-3.5_210621	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

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: 3768172) - continued									
EP2107024-015	0082_MW133_3.0-3.5_210621	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3768158)									
EP2107024-003	0082_MW128_3.7-4.2_210621	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
ES2124088-010	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
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3768172)									
EP2107024-015	0082_MW133_3.0-3.5_210621	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: 3768172) - continued									
EP2107024-015	0082_MW133_3.0-3.5_210621	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: 3768158)									
EP2107024-003	0082_MW128_3.7-4.2_210621	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
ES2124088-010	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	1.20	1.00	18.4	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	0.12	0.15	20.1	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3768172)									
EP2107024-015	0082_MW133_3.0-3.5_210621	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: 3768158)									
EP2107024-003	0082_MW128_3.7-4.2_210621	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	0.03	100	No Limit
ES2124088-010	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	2.01	1.98	1.5	0% - 20%
EP231P: PFAS Sums (QC Lot: 3768172)									
EP2107024-015	0082_MW133_3.0-3.5_210621	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: 3768222)								
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: 3756832)								
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: 3756833)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	105	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3768221)								
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	104	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3754890)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3754891)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3757366)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.2	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.4	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	94.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3755453)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	100	73.2	116
				<1	100 mg/L	101	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3755451)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	103	87.2	116
				<1	100 mg/L	103	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768158)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.0	72.0	130

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: 3768158) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	90.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	86.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	90.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	90.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	86.4	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768172)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	119	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	107	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	119	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	111	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	107	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768158)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	87.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	96.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	92.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	96.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	99.6	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	98.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	96.2	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	93.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	84.8	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.2	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768172)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.0	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	112	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	129	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	122	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	114	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	109	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	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: 3768158)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	92.0	67.0	137

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
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768158) - continued								
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	98.6	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	90.6	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	89.4	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	97.0	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	102	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	96.4	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768172)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	106	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	103	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	93.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	105	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	118	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	118	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768158)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	95.8	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	102	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	107	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	94.0	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768172)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	110	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	114	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	123	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	98.2	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(%)	Acceptable Limits (%)

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: 3754890)							
EP2107024-001	0082_OTH101_210621	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3754891)							
EP2107024-001	0082_OTH101_210621	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3755453)							
EP2107024-002	0082_OTH102_210621	EP002: Dissolved Organic Carbon	----	100 mg/L	106	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3755451)							
EP2107028-014	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768158)							
ES2124088-014	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	83.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	87.8	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	91.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	95.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	105	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	92.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768158)							
ES2124088-014	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	86.3	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	93.8	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	93.4	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	92.6	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	99.0	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.8	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	107	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	99.8	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	96.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	88.8	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	87.5	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768158)							
ES2124088-014	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	92.8	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	91.3	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	90.5	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	89.8	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	94.1	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: 3768158) - continued							
ES2124088-014	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	101	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	94.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768158)							
ES2124088-014	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	99.4	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	110	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	90.4	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107024**	Page	: 1 of 11
Client	: **CARDNO (WA) PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0082_PFASOMP	Date Samples Received	: 23-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 21
Order number	: DEF19009/0082	No. of samples analysed	: 21

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	EP2107024--001	0082_OTH101_210621	**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	EP2107024--001	0082_OTH101_210621	**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						
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	----	----	----	01-Jul-2021	21-Jun-2021	**10**

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	3	38	7.89	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)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	21-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**25-Jun-2021**	28-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**25-Jun-2021**	28-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)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	05-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**05-Jul-2021**	19-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**05-Jul-2021**	19-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)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW151S_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621	**21-Jun-2021**	**----**	----	----	**24-Jun-2021**	19-Jul-2021	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
0082_MW128_3.7-4.2_210621	**21-Jun-2021**	**----**	----	----	**24-Jun-2021**	19-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621, 0082_QC301_210621, 0082_QC302_210621, 0082_QC303_210621, 0082_QC401_210621, 0082_QC402_210621, 0082_QC403_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-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
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621, 0082_QC301_210621, 0082_QC302_210621, 0082_QC303_210621, 0082_QC401_210621, 0082_QC402_210621, 0082_QC403_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621, 0082_QC301_210621, 0082_QC302_210621, 0082_QC303_210621, 0082_QC401_210621, 0082_QC402_210621, 0082_QC403_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621, 0082_QC301_210621, 0082_QC302_210621, 0082_QC303_210621, 0082_QC401_210621, 0082_QC402_210621, 0082_QC403_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-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
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_OTH101_210621, 0082_OTH102_210621, 0082_MW128_3.7-4.2_210621, 0082_MW151S_210621, 0082_MW129_3.5-4.0_210621, 0082_MW130_6.9-7.4_210621, 0082_OTH103_210621, 0082_MW131_4.0-4.5_210621, 0082_OTH104_210621, 0082_OTH105_210621, 0082_OTH106_210621, 0082_MW132_8.5-9.0_210621, 0082_MW155S_210621, 0082_MW137_8.1-8.6_210621, 0082_MW133_3.0-3.5_210621, 0082_QC301_210621, 0082_QC302_210621, 0082_QC303_210621, 0082_QC401_210621, 0082_QC402_210621, 0082_QC403_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-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	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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	38	**7.89**	**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	15	**13.33**	**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	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	1	20	**5.00**	**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	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	15	**13.33**	**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	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	1	20	**5.00**	**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	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	15	**6.67**	**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	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	38	**2.63**	**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.

CHAIN OF CUSTODY

ALS COC#: 24382 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB SW

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: 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: NO 10am 23/6/21	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	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_SW161		21/06/2021 08:20 AM	Water	ALS: 5 Non ALS: 0	No	X		
002	0082_SW163		21/06/2021 09:01 AM	Water	ALS: 5 Non ALS: 0	No	X		
003	0082_QC101		21/06/2021 09:02 AM	Water	ALS: 5 Non ALS: 0	No	X		
004	0082_SW162		21/06/2021 09:09 AM	Water	ALS: 5 Non ALS: 0	No	X		
005	0082_SW181		21/06/2021 02:34 PM	Water	ALS: 3 Non ALS: 0	No	X		

Environmental Division Perth

Work Order Reference

EP2107025

Telephone : 61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: 24382 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB SW

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: 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	0082_SW161	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002535	Purple	No	
001	0082_SW161	HDPE (no PTFE)	20 mL	00352005019732	Grey	No	
001	0082_SW161	HDPE (no PTFE)	20 mL	00352005019318	Grey	No	
001	0082_SW161	Clear Plastic Bottle - Natural	250 mL	00070220186508	Green	No	
001	0082_SW161	Clear Plastic Bottle - Natural	250 mL	00070220186535	Green	No	
002	0082_SW163	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002547	Purple	No	
002	0082_SW163	HDPE (no PTFE)	20 mL	00352005019405	Grey	No	
002	0082_SW163	HDPE (no PTFE)	20 mL	00352005019538	Grey	No	
002	0082_SW163	Clear Plastic Bottle - Natural	250 mL	00070220186504	Green	No	
002	0082_SW163	Clear Plastic Bottle - Natural	250 mL	00070220186048	Green	No	
003	0082_QC101	Clear Plastic Bottle - Natural	250 mL	00070220186598	Green	No	
003	0082_QC101	Clear Plastic Bottle - Natural	250 mL	00070220186713	Green	No	
003	0082_QC101	HDPE (no PTFE)	20 mL	00352005019637	Grey	No	
003	0082_QC101	HDPE (no PTFE)	20 mL	00352005019490	Grey	No	
003	0082_QC101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003808	Purple	No	
004	0082_SW162	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002557	Purple	No	
004	0082_SW162	HDPE (no PTFE)	20 mL	00352005019528	Grey	No	
004	0082_SW162	HDPE (no PTFE)	20 mL	00352005019319	Grey	No	
004	0082_SW162	Clear Plastic Bottle - Natural	250 mL	00070220186727	Green	No	
004	0082_SW162	Clear Plastic Bottle - Natural	250 mL	00070220186560	Green	No	
005	0082_SW181	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016630	Purple	No	
005	0082_SW181	HDPE (no PTFE)	20 mL	00350719048999	Grey	No	
005	0082_SW181	Clear Plastic Bottle - Natural	250 mL	00070519189675	Green	No	

Total Bottle Count: ALS: 23, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107025**

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	: 24382	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 23-Jun-2021 10:00	Issue Date	: 24-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	: 9.4 - Ice 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	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)
EP2107025-001	21-Jun-2021 08:20	0082_SW161_210621	✓	✓	✓	✓	✓	✓	✓
EP2107025-002	21-Jun-2021 09:01	0082_SW163_210621	✓	✓	✓	✓	✓	✓	✓
EP2107025-003	21-Jun-2021 09:02	0082_QC101_210621	✓	✓	✓	✓	✓	✓	✓
EP2107025-004	21-Jun-2021 09:09	0082_SW162_210621	✓	✓	✓	✓	✓	✓	✓
EP2107025-005	21-Jun-2021 14:34	0082_SW181_210621	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107025-001	21-Jun-2021 08:20	0082_SW161_210621	✓
EP2107025-002	21-Jun-2021 09:01	0082_SW163_210621	✓
EP2107025-003	21-Jun-2021 09:02	0082_QC101_210621	✓
EP2107025-004	21-Jun-2021 09:09	0082_SW162_210621	✓
EP2107025-005	21-Jun-2021 14:34	0082_SW181_210621	✓

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_QC101_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_SW161_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_SW162_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_SW163_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_SW181_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-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	: **EP2107025**	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	: 23-Jun-2021 10:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24382	Issue Date	: 05-Jul-2021 14:26
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		

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
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.
- EA025H: Suspended solids result for #3 has been confirmed by re-preparation 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: SURFACE WATER (Matrix: WATER)			Sample ID	0082_SW161_210621	0082_SW163_210621	0082_QC101_210621	0082_SW162_210621	0082_SW181_210621
			Sampling date / time	21-Jun-2021 08:20	21-Jun-2021 09:01	21-Jun-2021 09:02	21-Jun-2021 09:09	21-Jun-2021 14:34
Compound	CAS Number	LOR	Unit	EP2107025-001	EP2107025-002	EP2107025-003	EP2107025-004	EP2107025-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.79	7.76	7.76	7.66	7.47
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6810	6890	6830	6670	43600
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	----	----	12	----	----
Suspended Solids (SS)	----	5	mg/L	<5	<5	----	<5	33
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	80	87	88	89	172
Total Alkalinity as CaCO3	----	1	mg/L	80	87	88	89	172
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	530	546	546	519	2470
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3210	3460	3440	3260	19500
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	123	123	122	119	519
Magnesium	7439-95-4	1	mg/L	228	235	234	224	1600
Sodium	7440-23-5	1	mg/L	1840	1900	1890	1810	12600
Potassium	7440-09-7	1	mg/L	94	97	93	94	668
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	103	111	110	104	605
ø Total Cations	----	0.01	meq/L	107	111	110	106	723
ø Ionic Balance	----	0.01	%	1.98	0.05	0.10	0.46	8.87
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	9	9	10	9	13
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: SURFACE WATER (Matrix: WATER)				Sample ID	0082_SW161_210621	0082_SW163_210621	0082_QC101_210621	0082_SW162_210621	0082_SW181_210621
				Sampling date / time	21-Jun-2021 08:20	21-Jun-2021 09:01	21-Jun-2021 09:02	21-Jun-2021 09:09	21-Jun-2021 14:34
Compound	CAS Number	LOR	Unit		EP2107025-001	EP2107025-002	EP2107025-003	EP2107025-004	EP2107025-005
					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: SURFACE WATER (Matrix: WATER)			Sample ID	0082_SW161_210621	0082_SW163_210621	0082_QC101_210621	0082_SW162_210621	0082_SW181_210621
			Sampling date / time	21-Jun-2021 08:20	21-Jun-2021 09:01	21-Jun-2021 09:02	21-Jun-2021 09:09	21-Jun-2021 14:34
Compound	CAS Number	LOR	Unit	EP2107025-001	EP2107025-002	EP2107025-003	EP2107025-004	EP2107025-005
				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	%	**80.6**	**83.5**	**81.1**	**88.4**	**78.9**
13C8-PFOA	----	0.02	%	**83.5**	**83.0**	**85.2**	**88.5**	**80.0**

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	: **EP2107025**	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	: 23-Jun-2021
Order number	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24382	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		

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
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 (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3768222)									
EP2107024-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.72	7.70	0.3	0% - 20%
EP2107024-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.63	7.63	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3760062)									
EP2107025-001	0082_SW161_210621	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6810	6970	2.4	0% - 20%
EP2107028-004	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	3840	3900	1.6	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3760063)									
EP2107025-001	0082_SW161_210621	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EP2107101-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	85	63	30.1	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3768221)									
EP2107024-002	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	133	128	4.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	133	128	4.4	0% - 20%
EP2107024-012	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	162	151	6.9	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	162	151	6.9	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3754890)									
EP2107024-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2420	2430	0.4	0% - 20%
EP2107024-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2280	2270	0.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3754891)									
EP2107024-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	18700	18500	1.3	0% - 20%
EP2107024-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	17800	17900	0.2	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	0082_SW161_210621	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: 3758236)									
EP2107025-001	0082_SW161_210621	EP002: Dissolved Organic Carbon	----	1	mg/L	9	9	0.0	No Limit
EP2107028-006	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768172)									
EP2107024-015	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: 3768172)									
EP2107024-015	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: 3768172)									
EP2107024-015	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: 3768172) - continued									
EP2107024-015	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3768172)									
EP2107024-015	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: 3768172)									
EP2107024-015	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: 3768222)								
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: 3760062)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	101	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3760063)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	105	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3768221)								
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	104	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3754890)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	106	87.7	113
				<1	500 mg/L	101	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3754891)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	87.9	114
				<1	1000 mg/L	104	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: 3758236)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	101	73.2	116
				<1	100 mg/L	100	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768172)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	119	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	107	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	119	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: 3768172) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	111	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	107	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768172)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.0	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	112	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	129	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	122	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	114	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	109	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	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: 3768172)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	106	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	103	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	93.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	105	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	118	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	118	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768172)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	110	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	114	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	123	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	98.2	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: 3754890)							
EP2107024-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3754891)							
EP2107024-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758236)							
EP2107025-002	0082_SW163_210621	EP002: Dissolved Organic Carbon	----	100 mg/L	101	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107025**	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	: 23-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS	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.**
- **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	EP2107024--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	EP2107024--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						
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	----	----	----	01-Jul-2021	21-Jun-2021	**10**

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	19	5.26	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: 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)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	21-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	05-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**05-Jul-2021**	19-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**05-Jul-2021**	19-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**25-Jun-2021**	28-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**----**	----	----	**25-Jun-2021**	19-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
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_SW161_210621, 0082_SW163_210621, 0082_QC101_210621, 0082_SW162_210621, 0082_SW181_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-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	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	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	20	**10.00**	**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	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	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	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	20	**10.00**	**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	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	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	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
Suspended Solids (High Level)	EA025H	1	14	**7.14**	**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	0	19	**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.

CHAIN OF CUSTODY

ALS COC#: 24384 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB SED

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: 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: 23/6/21 10am	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	0082_SD161		21/06/2021 08:22 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0082_SD163		21/06/2021 08:58 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0082_QC102		21/06/2021 09:00 AM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0082_SD162		21/06/2021 09:10 AM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0082_SD181		21/06/2021 02:35 PM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0082_SS173		21/06/2021 03:27 PM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0082_SS179		21/06/2021 03:52 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference
EP2107026

Telephone +61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: **24384** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB SED

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: 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	0082_SD161	Soil Glass Jar - Unpreserved	150 mL	00260321005622	Orange	No	
001	0082_SD161	HDPE Soil Jar	200 mL	00620719063146	Grey	No	
002	0082_SD163	HDPE Soil Jar	200 mL	00620719063106	Grey	No	
002	0082_SD163	Soil Glass Jar - Unpreserved	150 mL	00260321005730	Orange	No	
003	0082_QC102	HDPE Soil Jar	200 mL	00620719063118	Grey	No	
003	0082_QC102	Soil Glass Jar - Unpreserved	150 mL	00260321005715	Orange	No	
004	0082_SD162	HDPE Soil Jar	200 mL	00620719063211	Grey	No	
004	0082_SD162	Soil Glass Jar - Unpreserved	150 mL	00260321005747	Orange	No	
005	0082_SD181	Soil Glass Jar - Unpreserved	150 mL	00260321005641	Orange	No	
005	0082_SD181	HDPE Soil Jar	200 mL	00620719063167	Grey	No	
006	0082_SS173	HDPE Soil Jar	200 mL	00620719063143	Grey	No	
006	0082_SS173	Soil Glass Jar - Unpreserved	150 mL	00260321005694	Orange	No	
007	0082_SS179	HDPE Soil Jar	200 mL	00620719063139	Grey	No	
007	0082_SS179	Soil Glass Jar - Unpreserved	150 mL	00260321005727	Orange	No	

Total Bottle Count: ALS: 14, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107026**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24384	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 23-Jun-2021 10:00	Issue Date	: 24-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	: 9.4 - 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: **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)
EP2107026-001	21-Jun-2021 08:22	0082_SD161_210621	✓	✓	✓	✓
EP2107026-002	21-Jun-2021 08:58	0082_SD163_210621	✓	✓	✓	✓
EP2107026-003	21-Jun-2021 09:00	0082_QC102_210621	✓	✓	✓	✓
EP2107026-004	21-Jun-2021 09:10	0082_SD162_210621	✓	✓	✓	✓
EP2107026-005	21-Jun-2021 14:35	0082_SD181_210621	✓	✓	✓	✓
EP2107026-006	21-Jun-2021 15:27	0082_SS173_210621	✓	✓	✓	✓
EP2107026-007	21-Jun-2021 15:52	0082_SS179_210621	✓	✓	✓	✓

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	: **EP2107026**	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	: 23-Jun-2021 10:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24384	Issue Date	: 05-Jul-2021 17:51
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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*
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**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_SD161_210621	0082_SD163_210621	0082_QC102_210621	0082_SD162_210621	0082_SD181_210621
				Sampling date / time	21-Jun-2021 08:22	21-Jun-2021 08:58	21-Jun-2021 09:00	21-Jun-2021 09:10	21-Jun-2021 14:35
					EP2107026-001	EP2107026-002	EP2107026-003	EP2107026-004	EP2107026-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**8.8**	**9.4**	**9.3**	**9.3**	**8.8**
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**993**	**715**	**742**	**786**	**3480**
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**41.5**	**34.4**	**32.0**	**33.5**	**28.1**
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		**14.0**	**13.6**	**15.4**	**14.7**	**12.5**
Exchangeable Magnesium	----	0.1	meq/100g		**4.4**	**2.4**	**3.0**	**3.3**	**1.8**
Exchangeable Potassium	----	0.1	meq/100g		**0.2**	<0.1	**0.1**	**0.1**	<0.1
Exchangeable Sodium	----	0.1	meq/100g		**0.4**	**0.2**	**0.2**	**0.3**	**0.2**
Cation Exchange Capacity	----	0.1	meq/100g		**19.0**	**16.2**	**18.7**	**18.4**	**14.6**
Exchangeable Sodium Percent	----	0.1	%		**1.9**	**1.0**	**1.0**	**1.6**	**1.2**
EP004: Organic Matter									
Organic Matter	----	0.5	%		**5.6**	**4.0**	**3.7**	**4.1**	**4.2**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<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	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<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	<0.0002

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0082_SD161_210621	0082_SD163_210621	0082_QC102_210621	0082_SD162_210621	0082_SD181_210621
			Sampling date / time	21-Jun-2021 08:22	21-Jun-2021 08:58	21-Jun-2021 09:00	21-Jun-2021 09:10	21-Jun-2021 14:35
Compound	CAS Number	LOR	Unit	EP2107026-001	EP2107026-002	EP2107026-003	EP2107026-004	EP2107026-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<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	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<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	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<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	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<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	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<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	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<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	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<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	<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	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SEDIMENT** (Matrix: **SOIL**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_SD161_210621	0082_SD163_210621	0082_QC102_210621	0082_SD162_210621	0082_SD181_210621
				Sampling date / time	21-Jun-2021 08:22	21-Jun-2021 08:58	21-Jun-2021 09:00	21-Jun-2021 09:10	21-Jun-2021 14:35
					EP2107026-001	EP2107026-002	EP2107026-003	EP2107026-004	EP2107026-005
					Result	Result	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	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**92.5**	**82.5**	**82.5**	**81.5**	**78.0**
13C8-PFOA	----	0.0002	%		**86.0**	**83.5**	**86.0**	**84.0**	**85.0**

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0082_SS173_210621	0082_SS179_210621	----	----	----
			Sampling date / time	21-Jun-2021 15:27	21-Jun-2021 15:52	----	----	----
Compound	CAS Number	LOR	Unit	EP2107026-006	EP2107026-007	--------	--------	--------
				Result	Result	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.9**	**9.1**	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**60**	**923**	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**4.3**	**9.2**	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**6.9**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**0.4**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.4**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**7.8**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**0.6**	----	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	**4.2**	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	**0.6**	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	<0.1	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	**4.9**	----	----	----
Exchangeable Sodium Percent	----	0.1	%	----	**0.8**	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**1.6**	**1.4**	----	----	----
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	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SS173_210621	0082_SS179_210621	----	----	----
				Sampling date / time	21-Jun-2021 15:27	21-Jun-2021 15:52	----	----	----
Compound	CAS Number	LOR	Unit		EP2107026-006	EP2107026-007	--------	--------	--------
					Result	Result	----	----	----
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	----	----	----
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	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0082_SS173_210621	0082_SS179_210621	----	----	----
			Sampling date / time	21-Jun-2021 15:27	21-Jun-2021 15:52	----	----	----
Compound	CAS Number	LOR	Unit	EP2107026-006	EP2107026-007	--------	--------	--------
				Result	Result	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<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								
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	%	**84.0**	**81.0**	----	----	----
13C8-PFOA	----	0.0002	%	**85.5**	**83.5**	----	----	----

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

QUALITY CONTROL REPORT

Work Order	: **EP2107026**	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	: 23-Jun-2021
Order number	: DEF19009/0082	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24384	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
Quote number	: SY/139/19		
No. of samples received	: 7		
No. of samples analysed	: 7		

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: 3763999)									
EP2107026-001	0082_SD161_210621	EA002: pH Value	----	0.1	pH Unit	8.8	8.9	1.1	0% - 20%
EP2107034-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	7.6	7.5	1.5	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3763998)									
EP2107026-001	0082_SD161_210621	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	993	996	0.3	0% - 20%
EP2107034-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	14	14	0.0	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3761416)									
EP2107026-001	0082_SD161_210621	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%
ED007: Exchangeable Cations (QC Lot: 3770959)									
EP2107026-006	0082_SS173_210621	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%
ED008: Exchangeable Cations (QC Lot: 3770345)									
EP2107026-001	0082_SD161_210621	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%

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: 3770345) - continued									
EP2107187-002	Anonymous	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	0082_SD161_210621	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: 3768558)									
EP2107026-001	0082_SD161_210621	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
		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	0082_SD161_210621	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

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: 3768558) - continued									
EP2107034-004	Anonymous	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	0082_SD161_210621	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
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	0082_SD161_210621	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

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: 3768558) - continued									
EP2107034-004	Anonymous	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: 3763999)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3763998)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.4	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	----	----	----	----
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: 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

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: 3768558) - continued								
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)								
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	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768558)							
EP2107026-001	0082_SD161_210621	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

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)							
EP2107026-001	0082_SD161_210621	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
		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	0082_SD161_210621	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	0082_SD161_210621	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

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107026**	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	: 23-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 05-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 7
Order number	: DEF19009/0082	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.**
- **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						
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	01-Jul-2021	28-Jun-2021	**3**	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	01-Jul-2021	28-Jun-2021	**3**	----	----	----

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)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**01-Jul-2021**	28-Jun-2021	×	**01-Jul-2021**	01-Jul-2021	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**01-Jul-2021**	28-Jun-2021	×	**01-Jul-2021**	29-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
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	05-Jul-2021	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007)							
0082_SS173_210621	**21-Jun-2021**	**02-Jul-2021**	19-Jul-2021	✓	**02-Jul-2021**	19-Jul-2021	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS179_210621	**21-Jun-2021**	**02-Jul-2021**	19-Jul-2021	✓	**02-Jul-2021**	19-Jul-2021	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**05-Jul-2021**	19-Jul-2021	✓	**05-Jul-2021**	19-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**02-Jul-2021**	18-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
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
0082_SD161_210621, 0082_SD163_210621, 0082_QC102_210621, 0082_SD162_210621, 0082_SD181_210621, 0082_SS173_210621, 0082_SS179_210621	**21-Jun-2021**	**02-Jul-2021**	18-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
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	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
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	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
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	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).
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#: 24393 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: MD ALS 10am 23/6/21	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHB GW

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: 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	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_MW311		21/06/2021 11:06 AM	Water	ALS: 5 Non ALS: 0	No	X			
002	0082_MW310		21/06/2021 11:27 AM	Water	ALS: 5 Non ALS: 0	No	X			
003	0082_MW142		21/06/2021 12:02 PM	Water	ALS: 5 Non ALS: 0	No	X			
004	0082_QC103		21/06/2021 12:02 PM	Water	ALS: 5 Non ALS: 0	No	X			
005	0082_MW103D		21/06/2021 12:36 PM	Water	ALS: 5 Non ALS: 0	No	X			
006	0082_QC104		21/06/2021 12:37 PM	Water	ALS: 5 Non ALS: 0	No	X			
007	0082_MW115		21/06/2021 12:55 PM	Water	ALS: 5 Non ALS: 0	No	X			
008	0082_MW143		21/06/2021 01:12 PM	Water	ALS: 6 Non ALS: 0	No	X			
009	0082_MW113		21/06/2021 01:34 PM	Water	ALS: 6 Non ALS: 0	No	X			

Environmental Division
Perth
Work Order Reference
EP2107028

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: 24393 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: ALS 10am 23/6	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC - DEF19009/HEHB GW

ORDER NO: DEF19009/0082

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

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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 DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0082_MW105S		21/06/2021 02:01 PM	Water	ALS: 5 Non ALS: 0	No	X			
011	0082_MW145		21/06/2021 02:33 PM	Water	ALS: 5 Non ALS: 0	No	X			
012	0082_QC106		21/06/2021 02:34 PM	Water	ALS: 5 Non ALS: 0	No	X			
013	0082_MW326		21/06/2021 03:24 PM	Water	ALS: 7 Non ALS: 0	No	X			
014	0082_MW135		21/06/2021 04:21 PM	Water	ALS: 5 Non ALS: 0	No	Partial 7/8	X		

CHAIN OF CUSTODY

COC#: 24393 *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

ORDER NO: DEF19009/0082

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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	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
014	0082_MW135	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#: 24393 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

ORDER NO: DEF19009/0082

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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	0082_MW311	Clear Plastic Bottle - Natural	250 mL	00070220143120	Green	No	
001	0082_MW311	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002575	Purple	No	
001	0082_MW311	Clear Plastic Bottle - Natural	250 mL	00070220143158	Green	No	
001	0082_MW311	HDPE (no PTFE)	20 mL	00352005019654	Grey	No	
001	0082_MW311	HDPE (no PTFE)	20 mL	00352010040459	Grey	No	
002	0082_MW310	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002581	Purple	No	
002	0082_MW310	Clear Plastic Bottle - Natural	250 mL	00070220143091	Green	No	
002	0082_MW310	Clear Plastic Bottle - Natural	250 mL	00070220143138	Green	No	
002	0082_MW310	HDPE (no PTFE)	20 mL	00352005019667	Grey	No	
002	0082_MW310	HDPE (no PTFE)	20 mL	00352010040403	Grey	No	
003	0082_MW142	Clear Plastic Bottle - Natural	250 mL	00070220143067	Green	No	
003	0082_MW142	Clear Plastic Bottle - Natural	250 mL	00070220142976	Green	No	
003	0082_MW142	HDPE (no PTFE)	20 mL	00352005019516	Grey	No	
003	0082_MW142	HDPE (no PTFE)	20 mL	00352010040070	Grey	No	
003	0082_MW142	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002502	Purple	No	
004	0082_QC103	Clear Plastic Bottle - Natural	250 mL	00070220143126	Green	No	
004	0082_QC103	Clear Plastic Bottle - Natural	250 mL	00070220143032	Green	No	
004	0082_QC103	HDPE (no PTFE)	20 mL	00352010040416	Grey	No	
004	0082_QC103	HDPE (no PTFE)	20 mL	00352005019463	Grey	No	
004	0082_QC103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003882	Purple	No	
005	0082_MW103D	Clear Plastic Bottle - Natural	250 mL	00070220142841	Green	No	
005	0082_MW103D	Clear Plastic Bottle - Natural	250 mL	00070220143130	Green	No	
005	0082_MW103D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002574	Purple	No	
005	0082_MW103D	HDPE (no PTFE)	20 mL	00352010040072	Grey	No	
005	0082_MW103D	HDPE (no PTFE)	20 mL	00352005019400	Grey	No	
006	0082_QC104	Clear Plastic Bottle - Natural	250 mL	00070220143087	Green	No	

CHAIN OF CUSTODY

COC#: **24393** *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

ORDER NO: DEF19009/0082

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:

006	0082_QC104	Clear Plastic Bottle - Natural	250 mL	00070220143063	Green	No	
006	0082_QC104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020017408	Purple	No	
006	0082_QC104	HDPE (no PTFE)	20 mL	00352010040156	Grey	No	
006	0082_QC104	HDPE (no PTFE)	20 mL	00352005019345	Grey	No	
007	0082_MW115	Clear Plastic Bottle - Natural	250 mL	00070220142543	Green	No	
007	0082_MW115	Clear Plastic Bottle - Natural	250 mL	00070220142548	Green	No	
007	0082_MW115	HDPE (no PTFE)	20 mL	00352005019702	Grey	No	
007	0082_MW115	HDPE (no PTFE)	20 mL	00352005019892	Grey	No	
007	0082_MW115	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002636	Purple	No	
008	0082_MW143	Clear Plastic Bottle - Natural	250 mL	00070719042768	Green	No	
008	0082_MW143	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056628	Purple	No	
008	0082_MW143	HDPE (no PTFE)	20 mL	00350019165794	Grey	No	
008	0082_MW143	HDPE (no PTFE)	20 mL	00350019112570	Grey	No	
008	0082_MW143	HDPE (no PTFE)	20 mL	00352005016334	Grey	No	
008	0082_MW143	HDPE (no PTFE)	20 mL	00352005016268	Grey	No	
009	0082_MW113	HDPE (no PTFE)	20 mL	00350019112614	Grey	No	
009	0082_MW113	HDPE (no PTFE)	20 mL	00350019165633	Grey	No	
009	0082_MW113	HDPE (no PTFE)	20 mL	00350019030715	Grey	No	
009	0082_MW113	HDPE (no PTFE)	20 mL	00350019165872	Grey	No	
009	0082_MW113	Clear Plastic Bottle - Natural	250 mL	00071119012740	Green	No	
009	0082_MW113	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023783	Purple	No	
010	0082_MW105S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002732	Purple	No	
010	0082_MW105S	Clear Plastic Bottle - Natural	250 mL	00070220143108	Green	No	
010	0082_MW105S	HDPE (no PTFE)	20 mL	00352005019429	Grey	No	
010	0082_MW105S	HDPE (no PTFE)	20 mL	00352005019352	Grey	No	
010	0082_MW105S	Clear Plastic Bottle - Natural	250 mL	00070220143154	Green	No	
011	0082_MW145	Clear Plastic Bottle - Natural	250 mL	00070220142712	Green	No	

CHAIN OF CUSTODY

(ALS) COC#: **24393** *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

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: derp.labreports@esdat.com.au, maelle.bourdais@cardno.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

011	0082_MW145	HDPE (no PTFE)	20 mL	00352010040246	Grey	No	
011	0082_MW145	HDPE (no PTFE)	20 mL	00352005019331	Grey	No	
011	0082_MW145	Clear Plastic Bottle - Natural	250 mL	00070220142539	Green	No	
011	0082_MW145	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002622	Purple	No	
012	0082_QC106	Clear Plastic Bottle - Natural	250 mL	00070220142767	Green	No	
012	0082_QC106	Clear Plastic Bottle - Natural	250 mL	00070220142738	Green	No	
012	0082_QC106	HDPE (no PTFE)	20 mL	00352005019851	Grey	No	
012	0082_QC106	HDPE (no PTFE)	20 mL	00352005019335	Grey	No	
012	0082_QC106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002589	Purple	No	
013	0082_MW326	Clear Plastic Bottle - Natural	250 mL	00070220142769	Green	No	
013	0082_MW326	Clear Plastic Bottle - Natural	250 mL	00070220142786	Green	No	
013	0082_MW326	HDPE (no PTFE)	20 mL	00350019165803	Grey	No	
013	0082_MW326	HDPE (no PTFE)	20 mL	00352005019786	Grey	No	
013	0082_MW326	HDPE (no PTFE)	20 mL	00350019165843	Grey	No	
013	0082_MW326	HDPE (no PTFE)	20 mL	00352005019590	Grey	No	
013	0082_MW326	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002625	Purple	No	
014	0082_MW135	Amber TOC Vial - Sulfuric Acid	40 mL	00181020002508	Purple	No	
014	0082_MW135	Clear Plastic Bottle - Natural	250 mL	00070220142789	Green	No	
014	0082_MW135	Clear Plastic Bottle - Natural	250 mL	00070220142739	Green	No	
014	0082_MW135	HDPE (no PTFE)	20 mL	00352005019748	Grey	No	
014	0082_MW135	HDPE (no PTFE)	20 mL	00352005019549	Grey	No	

Total Bottle Count: ALS: 74, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107028**

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	: 24393	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 23-Jun-2021 10:00	Issue Date	: 24-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	: 9.4 - 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)
EP2107028-001	21-Jun-2021 11:06	0082_MW311_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-002	21-Jun-2021 11:27	0082_MW310_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-003	21-Jun-2021 12:02	0082_MW142_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-004	21-Jun-2021 12:02	0082_QC103_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-005	21-Jun-2021 12:36	0082_MW103D_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-006	21-Jun-2021 12:37	0082_QC104_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-007	21-Jun-2021 12:55	0082_MW115_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-008	21-Jun-2021 13:12	0082_MW143_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-009	21-Jun-2021 13:34	0082_MW113_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-010	21-Jun-2021 14:01	0082_MW105S_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-011	21-Jun-2021 14:33	0082_MW145_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-012	21-Jun-2021 14:34	0082_QC106_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-013	21-Jun-2021 15:24	0082_MW326_210621	✓	✓	✓	✓	✓	✓	✓
EP2107028-014	21-Jun-2021 16:21	0082_MW135_210621	✓	✓	✓	✓		✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107028-001	21-Jun-2021 11:06	0082_MW311_210621		✓
EP2107028-002	21-Jun-2021 11:27	0082_MW310_210621		✓
EP2107028-003	21-Jun-2021 12:02	0082_MW142_210621		✓
EP2107028-004	21-Jun-2021 12:02	0082_QC103_210621		✓
EP2107028-005	21-Jun-2021 12:36	0082_MW103D_210621		✓
EP2107028-006	21-Jun-2021 12:37	0082_QC104_210621		✓
EP2107028-007	21-Jun-2021 12:55	0082_MW115_210621		✓
EP2107028-008	21-Jun-2021 13:12	0082_MW143_210621		✓
EP2107028-009	21-Jun-2021 13:34	0082_MW113_210621		✓
EP2107028-010	21-Jun-2021 14:01	0082_MW105S_210621		✓

			WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107028-011	21-Jun-2021 14:33	0082_MW145_210621		✓
EP2107028-012	21-Jun-2021 14:34	0082_QC106_210621		✓
EP2107028-013	21-Jun-2021 15:24	0082_MW326_210621		✓
EP2107028-014	21-Jun-2021 16:21	0082_MW135_210621	✓	✓

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							
0082_MW103D_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW105S_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW113_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW115_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW135_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW142_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW143_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW145_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW310_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW311_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_MW326_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_QC103_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_QC104_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	×	----	----
0082_QC106_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-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	: **EP2107028**	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	: 23-Jun-2021 10:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 24-Jun-2021
C-O-C number	: 24393	Issue Date	: 06-Jul-2021 15:10
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
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
Daniel Fisher	Inorganics Analyst	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.
- ED093F: Cations results for samples EP2107028-003, 004 have been confirmed by re-analysis.
- ED041G: Sulfate results for samples EP2107028-003, 004 have been confirmed by re-analysis.
- Ionic Balance out of acceptable limits for sample #5 due to analytes not quantified in this report. Major cations (ED093F) and major anions (ED041G/ED045G/ED037-P) 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: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW311_210621	0082_MW310_210621	0082_MW142_210621	0082_QC103_210621	0082_MW103D_210621
				Sampling date / time	21-Jun-2021 11:06	21-Jun-2021 11:27	21-Jun-2021 12:02	21-Jun-2021 12:02	21-Jun-2021 12:36
Compound	CAS Number	LOR	Unit		EP2107028-001	EP2107028-002	EP2107028-003	EP2107028-004	EP2107028-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.09	7.89	7.61	7.64	7.49
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		420	1980	3870	3840	6030
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		109	720	1120	811	108
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		227	660	303	348	245
Total Alkalinity as CaCO3	----	1	mg/L		227	660	303	348	245
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		31	204	121	157	156
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		41	547	1600	1610	1660
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		26	28	226	182	337
Magnesium	7439-95-4	1	mg/L		13	37	156	156	200
Sodium	7440-23-5	1	mg/L		74	565	647	753	805
Potassium	7440-09-7	1	mg/L		19	51	66	66	37
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		6.34	32.9	53.7	55.6	55.0
ø Total Cations	----	0.01	meq/L		6.07	30.3	53.9	56.4	69.2
ø Ionic Balance	----	0.01	%		2.14	4.02	0.22	0.65	11.5
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		2	4	3	3	<1
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	1.50	0.42	0.24	0.27
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	2.36	0.46	0.27	0.37
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		0.49	12.0	3.27	2.00	2.82
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	0.27	1.07	0.48	0.13

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW311_210621	0082_MW310_210621	0082_MW142_210621	0082_QC103_210621	0082_MW103D_210621
				Sampling date / time	21-Jun-2021 11:06	21-Jun-2021 11:27	21-Jun-2021 12:02	21-Jun-2021 12:02	21-Jun-2021 12:36
Compound	CAS Number	LOR	Unit		EP2107028-001	EP2107028-002	EP2107028-003	EP2107028-004	EP2107028-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.26**	**3.66**	**48.6**	**27.3**	**2.64**
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	**1.0**	**1.7**	**1.0**	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.19**	**3.66**	**4.47**	**2.36**	**0.21**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.24**	**7.21**	**3.47**	**1.99**	**0.74**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.17**	**1.36**	**1.28**	**0.76**	**0.07**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.08**	**0.34**	**0.74**	**0.46**	**0.08**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	**0.16**	**0.09**	<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	0082_MW311_210621	0082_MW310_210621	0082_MW142_210621	0082_QC103_210621	0082_MW103D_210621
				Sampling date / time	21-Jun-2021 11:06	21-Jun-2021 11:27	21-Jun-2021 12:02	21-Jun-2021 12:02	21-Jun-2021 12:36
					EP2107028-001	EP2107028-002	EP2107028-003	EP2107028-004	EP2107028-005
					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	**0.44**	**4.74**	**3.15**	<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		**1.43**	**33.8**	**70.4**	**40.1**	**7.33**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.75**	**15.7**	**51.9**	**29.3**	**5.46**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**1.43**	**31.2**	**68.7**	**39.3**	**6.83**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**88.1**	**83.2**	**95.6**	**75.0**	**84.1**
13C8-PFOA	----	0.02	%		**87.0**	**84.3**	**85.7**	**79.8**	**86.3**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	0082_QC104_210621	0082_MW115_210621	0082_MW143_210621	0082_MW113_210621	0082_MW105S_210621
				Sampling date / time	21-Jun-2021 12:37	21-Jun-2021 12:55	21-Jun-2021 13:12	21-Jun-2021 13:34	21-Jun-2021 14:01
					EP2107028-006	EP2107028-007	EP2107028-008	EP2107028-009	EP2107028-010
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.61	7.66	8.33	8.13	7.95
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		5950	3040	852	2100	3110
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		160	414	154	315	2020
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	6	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		221	294	401	543	813
Total Alkalinity as CaCO3	----	1	mg/L		221	294	407	543	813
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		147	234	44	169	273
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		1930	1310	193	736	1060
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		315	101	6	16	29
Magnesium	7439-95-4	1	mg/L		186	114	7	23	66
Sodium	7440-23-5	1	mg/L		777	705	251	664	984
Potassium	7440-09-7	1	mg/L		34	81	31	45	85
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		61.9	47.7	14.5	35.1	51.8
ø Total Cations	----	0.01	meq/L		65.7	47.2	12.6	32.7	51.8
ø Ionic Balance	----	0.01	%		2.96	0.57	7.04	3.54	0.02
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		<1	3	<1	4	5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		0.26	0.17	0.06	0.02	0.14
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		0.36	0.26	0.06	0.02	0.20
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		2.76	3.42	0.66	0.23	1.66
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		0.13	0.21	0.08	<0.02	0.06

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_QC104_210621	0082_MW115_210621	0082_MW143_210621	0082_MW113_210621	0082_MW105S_210621
				Sampling date / time	21-Jun-2021 12:37	21-Jun-2021 12:55	21-Jun-2021 13:12	21-Jun-2021 13:34	21-Jun-2021 14:01
Compound	CAS Number	LOR	Unit		EP2107028-006	EP2107028-007	EP2107028-008	EP2107028-009	EP2107028-010
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**2.87**	**12.2**	**2.70**	**0.06**	**6.18**
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	**0.8**	**0.3**	<0.1	**0.2**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.21**	**2.36**	**0.95**	<0.02	**0.50**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.74**	**2.36**	**0.95**	**0.03**	**0.78**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.07**	**0.91**	**0.46**	<0.02	**0.48**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.08**	**0.53**	**0.30**	<0.01	**0.33**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	**0.03**	<0.02	<0.02	**0.13**
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	0082_QC104_210621	0082_MW115_210621	0082_MW143_210621	0082_MW113_210621	0082_MW105S_210621
				Sampling date / time	21-Jun-2021 12:37	21-Jun-2021 12:55	21-Jun-2021 13:12	21-Jun-2021 13:34	21-Jun-2021 14:01
					EP2107028-006	EP2107028-007	EP2107028-008	EP2107028-009	EP2107028-010
					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	**4.51**	**1.48**	<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		**7.48**	**27.8**	**8.00**	**0.36**	**10.7**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**5.63**	**15.6**	**3.36**	**0.29**	**7.84**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**6.99**	**27.3**	**7.86**	**0.34**	**10.3**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**81.2**	**83.2**	**81.3**	**82.9**	**85.2**
13C8-PFOA	----	0.02	%		**79.6**	**83.6**	**87.9**	**83.3**	**83.5**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0082_MW145_210621	0082_QC106_210621	0082_MW326_210621	0082_MW135_210621	----
			Sampling date / time	21-Jun-2021 14:33	21-Jun-2021 14:34	21-Jun-2021 15:24	21-Jun-2021 16:21	----
Compound	CAS Number	LOR	Unit	EP2107028-011	EP2107028-012	EP2107028-013	EP2107028-014	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.66	7.65	7.62	7.87	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	34500	34300	24600	16000	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	995	1000	482	22800	----
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	252	247	569	587	----
Total Alkalinity as CaCO3	----	1	mg/L	252	247	569	587	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2490	2480	2080	2080	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	18100	18200	12300	7000	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	603	613	369	125	----
Magnesium	7439-95-4	1	mg/L	1320	1340	882	398	----
Sodium	7440-23-5	1	mg/L	11500	11800	8570	5200	----
Potassium	7440-09-7	1	mg/L	570	583	333	220	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	567	570	402	252	----
ø Total Cations	----	0.01	meq/L	654	669	472	271	----
ø Ionic Balance	----	0.01	%	7.05	8.00	8.08	3.50	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	<1	2	7	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	----	----	10	----
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	0.06	<0.02	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW145_210621	0082_QC106_210621	0082_MW326_210621	0082_MW135_210621	----
				Sampling date / time	21-Jun-2021 14:33	21-Jun-2021 14:34	21-Jun-2021 15:24	21-Jun-2021 16:21	----
Compound	CAS Number	LOR	Unit		EP2107028-011	EP2107028-012	EP2107028-013	EP2107028-014	--------
					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	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	<0.01	**0.02**	<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	**0.02**	<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	0082_MW145_210621	0082_QC106_210621	0082_MW326_210621	0082_MW135_210621	----
				Sampling date / time	21-Jun-2021 14:33	21-Jun-2021 14:34	21-Jun-2021 15:24	21-Jun-2021 16:21	----
Compound	*CAS Number*	*LOR*	*Unit*		**EP2107028-011**	**EP2107028-012**	**EP2107028-013**	**EP2107028-014**	**--------**
					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	**0.10**	<0.01	**----**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	**0.08**	<0.01	**----**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	**0.10**	<0.01	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**81.1**	**82.9**	**78.8**	**78.0**	**----**
13C8-PFOA	----	0.02	%		**83.6**	**84.7**	**84.0**	**84.9**	**----**

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) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231S: PFAS Surrogate

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EP2107028**	Page	: 1 of 11
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	: 23-Jun-2021
Order number	: DEF19009/0082	Date Analysis Commenced	: 24-Jun-2021
C-O-C number	: 24393	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
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
Daniel Fisher	Inorganics Analyst	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: 3768224)									
EP2107028-008	0082_MW143_210621	EA005-P: pH Value	----	0.01	pH Unit	8.33	8.33	0.0	0% - 20%
EP2107085-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.63	7.59	0.5	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3760062)									
EP2107025-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6810	6970	2.4	0% - 20%
EP2107028-004	0082_QC103_210621	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	3840	3900	1.6	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3760074)									
EP2107010-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1380	1320	3.9	0% - 20%
EP2107028-011	0082_MW145_210621	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	34500	32200	7.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3760063)									
EP2107025-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EP2107101-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	85	63	30.1	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3760075)									
EP2107010-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EP2107028-013	0082_MW326_210621	EA025H: Suspended Solids (SS)	----	5	mg/L	482	503	4.2	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3768223)									
EP2107028-008	0082_MW143_210621	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	6	5	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	401	409	1.9	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	407	414	1.8	0% - 20%
EP2107085-001	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	55	56	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	55	56	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757660)									

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 (%)*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757660) - continued									
EP2107131-019	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	62	62	0.0	0% - 20%
EP2107131-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	84	86	2.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3757661)									
EP2107131-019	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	558	566	1.5	0% - 20%
EP2107131-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	818	814	0.5	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3757366)									
EP2107024-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	473	485	2.5	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1480	1530	2.9	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11100	11400	2.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	591	607	2.6	0% - 20%
EP2107024-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	493	523	5.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1450	1530	5.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10800	11500	6.2	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	566	603	6.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3757367)									
EP2107028-006	0082_QC104_210621	ED093F: Calcium	7440-70-2	1	mg/L	315	323	2.4	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	186	191	2.6	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	777	799	2.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	34	35	0.0	0% - 20%
EP2107033-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	12	11	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	8	8	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	592	593	0.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	30	30	0.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3758236)									
EP2107025-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	9	9	0.0	No Limit
EP2107028-006	0082_QC104_210621	EP002: Dissolved Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3755451)									
EP2107024-003	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	32	21	38.7	No Limit
EP2107173-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768172)									
EP2107024-015	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
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768594)									
EP2107028-008	0082_MW143_210621	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.70	2.89	6.7	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	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 (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768594) - continued									
EP2107028-008	0082_MW143_210621	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.66	0.59	11.4	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.09	12.2	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107033-006	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
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.08	0.08	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: 3768172)									
EP2107024-015	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
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3768594)									
EP2107028-008	0082_MW143_210621	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.30	0.36	17.8	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.95	0.96	0.0	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.95	0.91	4.5	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.46	0.54	15.3	0% - 20%
		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	0.3	0.3	0.0	No Limit
EP2107033-006	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

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: 3768594) - continued									
EP2107033-006	Anonymous	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: 3768172)									
EP2107024-015	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
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3768594)									
EP2107028-008	0082_MW143_210621	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
EP2107033-006	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

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: 3768594) - continued									
EP2107033-006	Anonymous	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: 3768172)									
EP2107024-015	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3768594)									
EP2107028-008	0082_MW143_210621	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	1.48	1.42	4.5	0% - 20%
		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
EP2107033-006	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: 3768172)									
EP2107024-015	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3768594)									
EP2107028-008	0082_MW143_210621	EP231X: Sum of PFAS	----	0.01	µg/L	8.00	8.17	2.1	0% - 20%
EP2107033-006	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.08	0.08	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: 3768224)								
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: 3760062)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	101	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3760074)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	100	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3760063)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	105	89.1	120
				<5	1000 mg/L	101	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3760075)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	103	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3768223)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	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	97.9	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757660)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	103	87.7	113
				<1	500 mg/L	99.8	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3757661)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.9	87.9	114
				<1	1000 mg/L	102	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3757366)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.2	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.4	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	94.1	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3757367)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.4	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: 3757367) - continued								
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.8	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	93.6	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758236)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	101	73.2	116
				<1	100 mg/L	100	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3755451)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	103	87.2	116
				<1	100 mg/L	103	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768172)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	119	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	107	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	119	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	111	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	107	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768594)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	86.0	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	92.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	101	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	102	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768172)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.0	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	112	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	129	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	122	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	114	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	109	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	112	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768594)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	80.4	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	97.8	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: 3768594) - continued								
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	96.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	98.8	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	105	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	99.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.0	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	85.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768172)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	106	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	103	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	93.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	105	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	118	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	118	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768594)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	95.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	95.9	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	82.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	99.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	93.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	93.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	91.6	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768172)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	110	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	114	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	123	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	98.2	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768594)								

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: 3768594) - continued								
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	99.8	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	98.8	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	90.8	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 Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757660)							
EP2107131-032	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	94.2	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3757661)							
EP2107131-032	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	104	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758236)							
EP2107025-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	101	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3755451)							
EP2107028-014	0082_MW135_210621	EP005: Total Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768594)							
EP2107028-009	0082_MW113_210621	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	93.6	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	96.0	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	97.2	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	96.0	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	102	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768594)							
EP2107028-009	0082_MW113_210621	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	82.5	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	105	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	104	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	105	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	112	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	109	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	102	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	101	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	72.0	134

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: 3768594) - continued							
EP2107028-009	0082_MW113_210621	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	69.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	91.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768594)							
EP2107028-009	0082_MW113_210621	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	98.8	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	98.6	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	89.2	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	96.7	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	101	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	110	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	107	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768594)							
EP2107028-009	0082_MW113_210621	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	98.6	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	106	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	93.8	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107028**	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	: 23-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 14
Order number	: DEF19009/0082	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							
0082_MW311_210621,	0082_MW310_210621,	----	----	----	01-Jul-2021	21-Jun-2021	**10**
0082_MW142_210621,	0082_QC103_210621,						
0082_MW103D_210621,	0082_QC104_210621,						
0082_MW115_210621,	0082_MW143_210621,						
0082_MW113_210621,	0082_MW105S_210621,						
0082_MW145_210621,	0082_QC106_210621,						
0082_MW326_210621,	0082_MW135_210621						

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	3	38	7.89	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)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	21-Jun-2021	×
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							

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)							
0082_MW311_210621, 0082_MW310_210621, 0082_MW142_210621, 0082_QC103_210621, 0082_MW103D_210621, 0082_QC104_210621, 0082_MW115_210621, 0082_MW143_210621, 0082_MW113_210621, 0082_MW105S_210621, 0082_MW145_210621, 0082_QC106_210621, 0082_MW326_210621, 0082_MW135_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_MW311_210621, 0082_MW310_210621, 0082_MW142_210621, 0082_QC103_210621, 0082_MW103D_210621, 0082_QC104_210621, 0082_MW115_210621, 0082_MW143_210621, 0082_MW113_210621, 0082_MW105S_210621, 0082_MW145_210621, 0082_QC106_210621, 0082_MW326_210621, 0082_MW135_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_MW311_210621, 0082_MW310_210621, 0082_MW142_210621, 0082_QC103_210621, 0082_MW103D_210621, 0082_QC104_210621, 0082_MW115_210621, 0082_MW143_210621, 0082_MW113_210621, 0082_MW105S_210621, 0082_MW145_210621, 0082_QC106_210621, 0082_MW326_210621, 0082_MW135_210621	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	05-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_MW311_210621, 0082_MW310_210621, 0082_MW142_210621, 0082_QC103_210621, 0082_MW103D_210621, 0082_QC104_210621, 0082_MW115_210621, 0082_MW143_210621, 0082_MW113_210621, 0082_MW105S_210621, 0082_MW145_210621, 0082_QC106_210621, 0082_MW326_210621, 0082_MW135_210621	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	19-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
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**----**	----	----	**01-Jul-2021**	19-Jul-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**----**	----	----	**25-Jun-2021**	19-Jul-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621								
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0082_MW135_210621		**21-Jun-2021**	**----**	----	----	**24-Jun-2021**	19-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							

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
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0082_MW311_210621,	0082_MW310_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
0082_MW142_210621,	0082_QC103_210621,							
0082_MW103D_210621,	0082_QC104_210621,							
0082_MW115_210621,	0082_MW143_210621,							
0082_MW113_210621,	0082_MW105S_210621,							
0082_MW145_210621,	0082_QC106_210621,							
0082_MW326_210621,	0082_MW135_210621							

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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	37	**10.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	38	**7.89**	**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	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	**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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	37	**5.41**	**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	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	**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	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	37	**5.41**	**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	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	**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	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	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.

CHAIN OF CUSTODY

ALS COC#: 24398 ALS Laboratory: EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: NO 10am 23/6/21	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHB GW

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: 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	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_MW315		21/06/2021 12:10 PM	Water	ALS: 5 Non ALS: 0	No	X			
002	0082_MW144S		21/06/2021 12:30 PM	Water	ALS: 5 Non ALS: 0	No	X			
003	0082_MW126		21/06/2021 12:44 PM	Water	ALS: 5 Non ALS: 0	No	X			
004	0082_MW154S	doc bottle is filtered	21/06/2021 01:02 PM	Water	ALS: 4 Non ALS: 1	No	Partial 7/8	X		
005	0082_MW118D		21/06/2021 01:06 PM	Water	ALS: 5 Non ALS: 0	No	X			
006	0082_MW109	not filtered, extra qc	21/06/2021 03:13 PM	Water	ALS: 7 Non ALS: 0	No	Partial 7/8	X		
007	0082_MW134		21/06/2021 03:46 PM	Water	ALS: 4 Non ALS: 1	No	X			
008	0082_MW148S		21/06/2021 04:11 PM	Water	ALS: 5 Non ALS: 0	No	X			

Environmental Division Perth

Work Order Reference

EP2107033

Telephone : +61-8-9406 1301

CHAIN OF CUSTODY

COC#: **24398** *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/HEHB GW

ORDER NO: DEF19009/0082

PROJECT MANAGER: Maelle Bourdais CONTACT PH:

PRIMARY SAMPLER: Maelle Bourdais 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

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
004	0082_MW154S	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	0082_MW109	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#: **24398** *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/HEHB GW

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

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SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0082_MW315	HDPE (no PTFE)	20 mL	00352010039975	Grey	No	
001	0082_MW315	HDPE (no PTFE)	20 mL	00352010040045	Grey	No	
001	0082_MW315	Clear Plastic Bottle - Natural	250 mL	00070220142658	Green	No	
001	0082_MW315	Clear Plastic Bottle - Natural	250 mL	00070220142692	Green	No	
001	0082_MW315	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020004148	Purple	No	
002	0082_MW144S	Clear Plastic Bottle - Natural	250 mL	00070220142785	Green	No	
002	0082_MW144S	Clear Plastic Bottle - Natural	250 mL	00070220142828	Green	No	
002	0082_MW144S	HDPE (no PTFE)	20 mL	00352005019677	Grey	No	
002	0082_MW144S	HDPE (no PTFE)	20 mL	00352005019351	Grey	No	
002	0082_MW144S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003944	Purple	No	
003	0082_MW126	HDPE (no PTFE)	20 mL	00352010039949	Grey	No	
003	0082_MW126	Clear Plastic Bottle - Natural	250 mL	00070220142770	Green	No	
003	0082_MW126	Clear Plastic Bottle - Natural	250 mL	00070220142766	Green	No	
003	0082_MW126	HDPE (no PTFE)	20 mL	00352010040002	Grey	No	
003	0082_MW126	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003954	Purple	No	
004	0082_MW154S	Clear Plastic Bottle - Natural	250 mL	00070220142667	Green	No	
004	0082_MW154S	HDPE (no PTFE)	20 mL	00352005019310	Grey	No	
004	0082_MW154S	HDPE (no PTFE)	20 mL	00352010039928	Grey	No	
004	0082_MW154S	Clear Plastic Bottle - Natural	250 mL	00070220142800	Green	No	
005	0082_MW118D	HDPE (no PTFE)	20 mL	00352010039959	Grey	No	
005	0082_MW118D	HDPE (no PTFE)	20 mL	00352005019897	Grey	No	
005	0082_MW118D	Clear Plastic Bottle - Natural	250 mL	00070220142834	Green	No	
005	0082_MW118D	Clear Plastic Bottle - Natural	250 mL	00070220142705	Green	No	
005	0082_MW118D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003923	Purple	No	
006	0082_MW109	HDPE (no PTFE)	20 mL	00352005019913	Grey	No	
006	0082_MW109	HDPE (no PTFE)	20 mL	00352005019699	Grey	No	

CHAIN OF CUSTODY

COC#: **24398** *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/HEHB GW

ORDER NO: DEF19009/0082

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

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	0082_MW109	Clear Plastic Bottle - Natural	250 mL	00070220142690	Green	No	
006	0082_MW109	Clear Plastic Bottle - Natural	250 mL	00070220142373	Green	No	
006	0082_MW109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003961	Purple	No	
006	0082_MW109	HDPE (no PTFE)	20 mL	00350019165880	Grey	No	
006	0082_MW109	HDPE (no PTFE)	20 mL	00350019165920	Grey	No	
007	0082_MW134	HDPE (no PTFE)	20 mL	00352005019909	Grey	No	
007	0082_MW134	HDPE (no PTFE)	20 mL	00352005019810	Grey	No	
007	0082_MW134	Clear Plastic Bottle - Natural	250 mL	00070220142262	Green	No	
007	0082_MW134	Clear Plastic Bottle - Natural	250 mL	00070220142434	Green	No	
008	0082_MW148S	HDPE (no PTFE)	20 mL	00352005019565	Grey	No	
008	0082_MW148S	HDPE (no PTFE)	20 mL	00352010039929	Grey	No	
008	0082_MW148S	Clear Plastic Bottle - Natural	250 mL	00070220142799	Green	No	
008	0082_MW148S	Clear Plastic Bottle - Natural	250 mL	00070220142788	Green	No	
008	0082_MW148S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003912	Purple	No	

Total Bottle Count: ALS: 40, Non ALS: 2

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107033**

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	: 24398	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 23-Jun-2021 10:00	Issue Date	: 24-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	: 9.4 - 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	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)
EP2107033-001	21-Jun-2021 12:10	0082_MW315_210621	✓	✓	✓	✓	✓	✓	✓
EP2107033-002	21-Jun-2021 12:30	0082_MW144S_210621	✓	✓	✓	✓	✓	✓	✓
EP2107033-003	21-Jun-2021 12:44	0082_MW126_210621	✓	✓	✓	✓	✓	✓	✓
EP2107033-004	21-Jun-2021 13:02	0082_MW154S_210621	✓	✓	✓	✓		✓	✓
EP2107033-005	21-Jun-2021 13:06	0082_MW118D_210621	✓	✓	✓	✓	✓	✓	✓
EP2107033-006	21-Jun-2021 15:13	0082_MW109_210621	✓	✓	✓	✓		✓	✓
EP2107033-007	21-Jun-2021 15:46	0082_MW134_210621	✓	✓	✓	✓	✓	✓	✓
EP2107033-008	21-Jun-2021 16:11	0082_MW148S_210621	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107033-001	21-Jun-2021 12:10	0082_MW315_210621		✓
EP2107033-002	21-Jun-2021 12:30	0082_MW144S_210621		✓
EP2107033-003	21-Jun-2021 12:44	0082_MW126_210621		✓
EP2107033-004	21-Jun-2021 13:02	0082_MW154S_210621	✓	✓
EP2107033-005	21-Jun-2021 13:06	0082_MW118D_210621		✓
EP2107033-006	21-Jun-2021 15:13	0082_MW109_210621	✓	✓
EP2107033-007	21-Jun-2021 15:46	0082_MW134_210621		✓
EP2107033-008	21-Jun-2021 16:11	0082_MW148S_210621		✓

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							

0082_MW109_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	✘	----	----
0082_MW118D_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	✘	----	----
0082_MW126_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	✘	----	----
0082_MW134_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	✘	----	----
0082_MW144S_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	✘	----	----
0082_MW148S_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	✘	----	----
0082_MW154S_2106	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-Jun-2021	✘	----	----
0082_MW315_21062	Clear Plastic Bottle - Natural	----	21-Jun-2021	23-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	: **EP2107033**	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	: 23-Jun-2021 10:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 24-Jun-2021
C-O-C number	: 24398	Issue Date	: 05-Jul-2021 14:28
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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
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.
- (EP002) Raised LOR on samples #1 & #5 due to possible sample matrix interference.
- 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_MW315_210621	0082_MW144S_210621	0082_MW126_210621	0082_MW154S_210621	0082_MW118D_210621
				Sampling date / time	21-Jun-2021 12:10	21-Jun-2021 12:30	21-Jun-2021 12:44	21-Jun-2021 13:02	21-Jun-2021 13:06
Compound	CAS Number	LOR	Unit		EP2107033-001	EP2107033-002	EP2107033-003	EP2107033-004	EP2107033-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.34	8.12	7.90	7.53	8.08
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		1000	1740	1400	15700	3840
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		198	300	69	1310	148
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		10	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		666	647	409	432	672
Total Alkalinity as CaCO3	----	1	mg/L		676	647	409	432	672
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		96	129	109	1110	271
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		134	539	505	9350	1630
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		5	12	47	319	28
Magnesium	7439-95-4	1	mg/L		10	8	29	591	67
Sodium	7440-23-5	1	mg/L		354	592	474	4950	1270
Potassium	7440-09-7	1	mg/L		34	30	32	266	85
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		19.3	30.8	24.7	295	65.0
ø Total Cations	----	0.01	meq/L		17.3	27.8	26.2	287	64.3
ø Ionic Balance	----	0.01	%		5.31	5.19	2.91	1.51	0.56
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		<2	2	2	----	<2
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	----	----	7	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	0.27	0.06	0.13	0.70
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	0.36	0.07	0.11	0.70

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	0082_MW315_210621	0082_MW144S_210621	0082_MW126_210621	0082_MW154S_210621	0082_MW118D_210621
				Sampling date / time	21-Jun-2021 12:10	21-Jun-2021 12:30	21-Jun-2021 12:44	21-Jun-2021 13:02	21-Jun-2021 13:06
					EP2107033-001	EP2107033-002	EP2107033-003	EP2107033-004	EP2107033-005
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	**2.89**	**0.65**	**0.53**	**5.53**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	**0.17**	**0.04**	**0.03**	**0.64**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.01	**8.36**	**2.25**	**0.54**	**12.9**
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	**0.7**	**0.2**	<0.1	**0.4**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	**2.44**	**0.50**	**0.14**	**1.29**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	**2.22**	**0.50**	**0.14**	**2.03**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	**2.08**	**0.24**	**0.06**	**0.61**
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	**0.95**	**0.16**	**0.05**	**1.24**
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	**0.35**	**0.06**	<0.02	**0.10**
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	0082_MW315_210621	0082_MW144S_210621	0082_MW126_210621	0082_MW154S_210621	0082_MW118D_210621
				Sampling date / time	21-Jun-2021 12:10	21-Jun-2021 12:30	21-Jun-2021 12:44	21-Jun-2021 13:02	21-Jun-2021 13:06
					EP2107033-001	EP2107033-002	EP2107033-003	EP2107033-004	EP2107033-005
					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	**0.06**
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	**0.54**	<0.05	<0.05	**12.5**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	**0.16**	<0.05	<0.05	**0.08**
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	**21.5**	**4.73**	**1.73**	**38.8**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	**11.2**	**2.90**	**1.07**	**18.4**
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	**20.6**	**4.56**	**1.59**	**37.3**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**82.9**	**70.5**	**83.7**	**81.1**	**87.6**
13C8-PFOA	----	0.02	%		**89.0**	**72.7**	**88.4**	**84.4**	**85.5**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_MW109_210621	0082_MW134_210621	0082_MW148S_210621	----	----
				Sampling date / time	21-Jun-2021 15:13	21-Jun-2021 15:46	21-Jun-2021 16:11	----	----
Compound	CAS Number	LOR	Unit		EP2107033-006	EP2107033-007	EP2107033-008	--------	--------
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.99	7.57	7.41	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		6920	30500	29700	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		1790	156	155	----	----
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		491	312	333	----	----
Total Alkalinity as CaCO3	----	1	mg/L		491	312	333	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		900	1630	1830	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		3240	13800	14000	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		44	598	627	----	----
Magnesium	7439-95-4	1	mg/L		91	1050	1110	----	----
Sodium	7440-23-5	1	mg/L		2350	8920	9190	----	----
Potassium	7440-09-7	1	mg/L		114	374	404	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		120	429	440	----	----
ø Total Cations	----	0.01	meq/L		115	514	533	----	----
ø Ionic Balance	----	0.01	%		2.18	8.94	9.57	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	4	<1	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		8	----	----	----	----
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	0082_MW109_210621	0082_MW134_210621	0082_MW148S_210621	----	----
				Sampling date / time	21-Jun-2021 15:13	21-Jun-2021 15:46	21-Jun-2021 16:11	----	----
Compound	CAS Number	LOR	Unit		EP2107033-006	EP2107033-007	EP2107033-008	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.08**	<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	0082_MW109_210621	0082_MW134_210621	0082_MW148S_210621	----	----
				Sampling date / time	21-Jun-2021 15:13	21-Jun-2021 15:46	21-Jun-2021 16:11	----	----
Compound	CAS Number	LOR	Unit		EP2107033-006	EP2107033-007	EP2107033-008	--------	--------
					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		**0.08**	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.08**	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.08**	<0.01	<0.01	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**81.5**	**82.9**	**83.5**	----	----
13C8-PFOA	----	0.02	%		**82.8**	**85.6**	**85.2**	----	----

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	: **EP2107033**	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	: 23-Jun-2021
Order number	: DEF19009/0082	Date Analysis Commenced	: 24-Jun-2021
C-O-C number	: 24398	Issue Date	: 05-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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
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	0082_MW144S_210621	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: 3760074)									
EP2107010-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	1380	1320	3.9	0% - 20%
EP2107028-011	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	34500	32200	7.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3760091)									
EP2107033-007	0082_MW134_210621	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	30500	29600	3.2	0% - 20%
EP2107095-004	Anonymous	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: 3760075)									
EP2107010-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EP2107028-013	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	482	503	4.2	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3760092)									
EP2107033-007	0082_MW134_210621	EA025H: Suspended Solids (SS)	----	5	mg/L	156	150	3.4	0% - 20%
EP2107095-008	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	12	8	36.1	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3771002)									
EP2107033-002	0082_MW144S_210621	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: 3757676)									

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 (%)*
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3757676) - continued									
EP2107033-001	0082_MW315_210621	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	96	96	0.0	0% - 20%
EP2107033-008	0082_MW148S_210621	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	0082_MW315_210621	ED045G: Chloride	16887-00-6	1	mg/L	134	134	0.0	0% - 20%
EP2107033-008	0082_MW148S_210621	ED045G: Chloride	16887-00-6	1	mg/L	14000	13900	0.7	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3757367)									
EP2107028-006	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	315	323	2.4	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	186	191	2.6	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	777	799	2.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	34	35	0.0	0% - 20%
EP2107033-002	0082_MW144S_210621	ED093F: Calcium	7440-70-2	1	mg/L	12	11	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	8	8	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	592	593	0.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	30	30	0.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3758236)									
EP2107025-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	9	9	0.0	No Limit
EP2107028-006	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3758251)									
EP2107033-003	0082_MW126_210621	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%
EP005: Total Organic Carbon (TOC) (QC Lot: 3755451)									
EP2107024-003	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	32	21	38.7	No Limit
EP2107173-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3768594)									
EP2107028-008	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.70	2.89	6.7	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.05	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.66	0.59	11.4	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.09	12.2	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107033-006	0082_MW109_210621	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	0.08	0.08	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: 3768594)									
EP2107028-008	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.30	0.36	17.8	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.95	0.96	0.0	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: 3768594) - continued									
EP2107028-008	Anonymous	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.95	0.91	4.5	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.46	0.54	15.3	0% - 20%
		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	0.3	0.3	0.0	No Limit
EP2107033-006	0082_MW109_210621	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: 3768594)									
EP2107028-008	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
EP2107033-006	0082_MW109_210621	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

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: 3768594) - continued									
EP2107033-006	0082_MW109_210621	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: 3768594)									
EP2107028-008	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	1.48	1.42	4.5	0% - 20%
		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
EP2107033-006	0082_MW109_210621	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: 3768594)									
EP2107028-008	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	8.00	8.17	2.1	0% - 20%
EP2107033-006	0082_MW109_210621	EP231X: Sum of PFAS	----	0.01	µg/L	0.08	0.08	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: 3760074)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	100	88.1	114
				<10	1000 mg/L	103	88.1	114
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: 3760075)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	103	89.1	120
				<5	1000 mg/L	102	89.1	120
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
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: 3757367)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.4	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.8	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	93.6	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758236)								

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
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758236) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	101	73.2	116
				<1	100 mg/L	100	73.2	116
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
EP005: Total Organic Carbon (TOC) (QCLot: 3755451)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	103	87.2	116
				<1	100 mg/L	103	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768594)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	86.0	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	92.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	101	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	102	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768594)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	80.4	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	97.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	96.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	98.8	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	105	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	99.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.0	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	85.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768594)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	95.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	95.9	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	82.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	99.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	93.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	93.8	65.0	136

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: 3768594) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	91.6	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768594)								
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	99.8	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	98.8	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	90.8	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 Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3757676)							
EP2107033-001	0082_MW315_210621	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	0082_MW315_210621	ED045G: Chloride	16887-00-6	1000 mg/L	103	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758236)							
EP2107025-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	101	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3758251)							
EP2107033-005	0082_MW118D_210621	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3755451)							
EP2107028-014	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3768594)							
EP2107028-009	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	93.6	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	96.0	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	97.2	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	96.0	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	102	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3768594)							
EP2107028-009	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	82.5	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	105	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	104	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	105	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: 3768594) - continued							
EP2107028-009	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	112	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	109	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	102	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	101	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	69.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	91.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3768594)							
EP2107028-009	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	98.8	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	98.6	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	89.2	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	96.7	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	101	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	110	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	107	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3768594)							
EP2107028-009	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	98.6	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	106	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	93.8	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107033**	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	: 23-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 05-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 8
Order number	: DEF19009/0082	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.**
- **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: **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_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	----	----	----	02-Jul-2021	21-Jun-2021	**11**

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_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	**21-Jun-2021**	**----**	----	----	**02-Jul-2021**	21-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-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)								
0082_MW315_210621,	0082_MW144S_210621,	**21-Jun-2021**	**----**	----	----	**02-Jul-2021**	05-Jul-2021	✓
0082_MW126_210621,	0082_MW154S_210621,							
0082_MW118D_210621,	0082_MW109_210621,							
0082_MW134_210621,	0082_MW148S_210621							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0082_MW315_210621,	0082_MW144S_210621,	**21-Jun-2021**	**----**	----	----	**05-Jul-2021**	19-Jul-2021	✓
0082_MW126_210621,	0082_MW154S_210621,							
0082_MW118D_210621,	0082_MW109_210621,							
0082_MW134_210621,	0082_MW148S_210621							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0082_MW315_210621,	0082_MW144S_210621,	**21-Jun-2021**	**----**	----	----	**05-Jul-2021**	19-Jul-2021	✓
0082_MW126_210621,	0082_MW154S_210621,							
0082_MW118D_210621,	0082_MW109_210621,							
0082_MW134_210621,	0082_MW148S_210621							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0082_MW315_210621,	0082_MW144S_210621,	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	28-Jun-2021	✓
0082_MW126_210621,	0082_MW154S_210621,							
0082_MW118D_210621,	0082_MW109_210621,							
0082_MW134_210621,	0082_MW148S_210621							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0082_MW315_210621,	0082_MW144S_210621,	**21-Jun-2021**	**----**	----	----	**25-Jun-2021**	19-Jul-2021	✓
0082_MW126_210621,	0082_MW118D_210621,							
0082_MW134_210621,	0082_MW148S_210621							
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0082_MW154S_210621,	0082_MW109_210621	**21-Jun-2021**	**----**	----	----	**24-Jun-2021**	19-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0082_MW315_210621,	0082_MW144S_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
0082_MW126_210621,	0082_MW154S_210621,							
0082_MW118D_210621,	0082_MW109_210621,							
0082_MW134_210621,	0082_MW148S_210621							

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
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW315_210621, 0082_MW144S_210621, 0082_MW126_210621, 0082_MW154S_210621, 0082_MW118D_210621, 0082_MW109_210621, 0082_MW134_210621, 0082_MW148S_210621	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	18-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	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	17	**11.76**	**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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	**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	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	**5.88**	**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	4	34	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	**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	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	**5.88**	**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	2	34	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	**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	2	40	**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

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

ALS COC#: **24402** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHB SED

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: 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: 23/6 N 10am	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	0082_SD164		21/06/2021 01:11 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0082_QC105		21/06/2021 01:12 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0082_SD165		21/06/2021 01:39 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0082_SD167		21/06/2021 01:53 PM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0082_SD169		21/06/2021 01:55 PM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0082_SS171		21/06/2021 02:11 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2107034

Telephone : -- 61-8-9406 1301

CHAIN OF CUSTODY

ALS COC#: **24402** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHB SED

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: 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	0082_SD164	Soil Glass Jar - Unpreserved	150 mL	00260321005600	Orange	No	
001	0082_SD164	HDPE Soil Jar	200 mL	00620719063103	Grey	No	
002	0082_QC105	Soil Glass Jar - Unpreserved	150 mL	00260321005607	Orange	No	
002	0082_QC105	HDPE Soil Jar	200 mL	00620719063112	Grey	No	
003	0082_SD165	Soil Glass Jar - Unpreserved	150 mL	00260321005729	Orange	No	
003	0082_SD165	HDPE Soil Jar	200 mL	00620719063140	Grey	No	
004	0082_SD167	HDPE Soil Jar	200 mL	00620719063073	Grey	No	
004	0082_SD167	Soil Glass Jar - Unpreserved	150 mL	00260321005755	Orange	No	
005	0082_SD169	Soil Glass Jar - Unpreserved	150 mL	00260321005688	Orange	No	
005	0082_SD169	HDPE Soil Jar	200 mL	00620719063089	Grey	No	
006	0082_SS171	Soil Glass Jar - Unpreserved	150 mL	00260321005580	Orange	No	
006	0082_SS171	HDPE Soil Jar	200 mL	00620719063222	Grey	No	

Total Bottle Count: ALS: 12, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107034**

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	: DEF19009/0082	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24402	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 23-Jun-2021 10:00	Issue Date	: 24-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	: 9.4 - 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: **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)
EP2107034-001	21-Jun-2021 13:11	0082_SD164_210621	✓	✓	✓	✓
EP2107034-002	21-Jun-2021 13:12	0082_QC105_210621	✓	✓	✓	✓
EP2107034-003	21-Jun-2021 13:39	0082_SD165_210621	✓	✓	✓	✓
EP2107034-004	21-Jun-2021 13:53	0082_SD167_210621	✓	✓	✓	✓
EP2107034-005	21-Jun-2021 13:55	0082_SD169_210621	✓	✓	✓	✓
EP2107034-006	21-Jun-2021 14:11	0082_SS171_210621	✓	✓	✓	✓

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	: **EP2107034**	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	: 23-Jun-2021 10:00
Order number	: DEF19009/0082	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24402	Issue Date	: 06-Jul-2021 15:11
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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
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**)

Compound	CAS Number	LOR	Unit	Sample ID	0082_SD164_210621	0082_QC105_210621	0082_SD165_210621	0082_SD167_210621	0082_SD169_210621
				Sampling date / time	21-Jun-2021 13:11	21-Jun-2021 13:12	21-Jun-2021 13:39	21-Jun-2021 13:53	21-Jun-2021 13:55
					EP2107034-001	EP2107034-002	EP2107034-003	EP2107034-004	EP2107034-005
					Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		**8.8**	**8.8**	**7.6**	**8.0**	**9.2**
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		**38**	**34**	**14**	**33**	**41**
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**4.8**	**4.6**	**4.5**	**13.0**	**2.0**
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		**3.7**	**2.4**	**2.0**	**2.4**	**6.4**
Exchangeable Magnesium	----	0.1	meq/100g		**0.5**	**0.4**	**0.5**	**0.3**	**0.3**
Exchangeable Potassium	----	0.1	meq/100g		**0.2**	**0.2**	**0.1**	**0.2**	**0.1**
Exchangeable Sodium	----	0.1	meq/100g		<0.1	<0.1	<0.1	<0.1	<0.1
Cation Exchange Capacity	----	0.1	meq/100g		**4.4**	**3.0**	**2.6**	**2.9**	**6.8**
Exchangeable Sodium Percent	----	0.1	%		**0.7**	**0.7**	**0.7**	**0.9**	**0.3**
EP004: Organic Matter									
Organic Matter	----	0.5	%		**1.5**	**1.5**	**0.5**	**1.3**	**1.3**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0034**	**0.0047**	**0.0005**	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<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	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		**0.0003**	**0.0004**	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SD164_210621	0082_QC105_210621	0082_SD165_210621	0082_SD167_210621	0082_SD169_210621
				Sampling date / time	21-Jun-2021 13:11	21-Jun-2021 13:12	21-Jun-2021 13:39	21-Jun-2021 13:53	21-Jun-2021 13:55
Compound	CAS Number	LOR	Unit		EP2107034-001	EP2107034-002	EP2107034-003	EP2107034-004	EP2107034-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<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	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<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	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<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	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<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	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<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	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<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	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<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	<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	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0037**	**0.0051**	**0.0005**	<0.0002	<0.0002

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SD164_210621	0082_QC105_210621	0082_SD165_210621	0082_SD167_210621	0082_SD169_210621
				Sampling date / time	21-Jun-2021 13:11	21-Jun-2021 13:12	21-Jun-2021 13:39	21-Jun-2021 13:53	21-Jun-2021 13:55
Compound	CAS Number	LOR	Unit		EP2107034-001	EP2107034-002	EP2107034-003	EP2107034-004	EP2107034-005
					Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0034**	**0.0047**	**0.0005**	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0034**	**0.0047**	**0.0005**	<0.0002	<0.0002
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**82.5**	**85.5**	**85.5**	**76.0**	**86.5**
13C8-PFOA	----	0.0002	%		**81.0**	**87.0**	**85.0**	**85.0**	**87.0**

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0082_SS171_210621	----	----	----	----
			Sampling date / time	21-Jun-2021 14:11	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107034-006	--------	--------	--------	--------
				Result	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.8**	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	**44**	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**16.2**	----	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**4.0**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**0.3**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.2**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**4.5**	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	**1.1**	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	**1.2**	----	----	----	----
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	**0.0056**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	**0.0034**	----	----	----	----
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	**0.0003**	----	----	----	----

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0082_SS171_210621	----	----	----	----
				Sampling date / time	21-Jun-2021 14:11	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107034-006	--------	--------	--------	--------
					Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		**0.0003**	----	----	----	----
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		**0.0098**	----	----	----	----

Analytical Results

Sub-Matrix: **SEDIMENT** (Matrix: **SOIL**)				Sample ID	**0082_SS171_210621**	**----**	**----**	**----**	**----**
				Sampling date / time	21-Jun-2021 14:11	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EP2107034-006**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0056**	**----**	**----**	**----**	**----**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0056**	**----**	**----**	**----**	**----**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**85.0**	**----**	**----**	**----**	**----**
13C8-PFOA	----	0.0002	%		**86.5**	**----**	**----**	**----**	**----**

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	: **EP2107034**	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	: 23-Jun-2021
Order number	: DEF19009/0082	Date Analysis Commenced	: 28-Jun-2021
C-O-C number	: 24402	Issue Date	: 06-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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
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: 3763999)									
EP2107026-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.8	8.9	1.1	0% - 20%
EP2107034-003	0082_SD165_210621	EA002: pH Value	----	0.1	pH Unit	7.6	7.5	1.5	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3763998)									
EP2107026-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	993	996	0.3	0% - 20%
EP2107034-003	0082_SD165_210621	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	14	14	0.0	0% - 50%
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	0082_SD165_210621	EA055: Moisture Content	----	0.1	%	4.5	4.6	3.5	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3774469)									
EP2107034-001	0082_SD164_210621	ED007: Exchangeable Sodium Percent	----	0.1	%	0.7	0.6	17.1	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	3.7	4.3	14.9	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.5	0.5	0.0	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	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	4.4	5.0	12.3	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	0082_SD167_210621	EP004: Organic Matter	----	0.5	%	1.3	1.1	10.6	No Limit
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

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									
EP2107026-001	Anonymous	EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2107034-004	0082_SD167_210621	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: 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	0082_SD167_210621	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

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-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
EP2107034-004	0082_SD167_210621	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	0082_SD167_210621	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: 3763999)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3763998)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.4	93.6	106
ED007: Exchangeable Cations (QCLot: 3774469)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	93.0	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	98.3	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	109	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	109	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	94.5	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
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: 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

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107034**	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	: 23-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 06-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 6
Order number	: DEF19009/0082	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.**
- **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						
0082_SD164_210621, 0082_QC105_210621, 0082_SD165_210621, 0082_SD167_210621, 0082_SD169_210621, 0082_SS171_210621	01-Jul-2021	28-Jun-2021	**3**	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
0082_SD164_210621, 0082_QC105_210621, 0082_SD165_210621, 0082_SD167_210621, 0082_SD169_210621, 0082_SS171_210621	01-Jul-2021	28-Jun-2021	**3**	----	----	----

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)							
0082_SD164_210621, 0082_QC105_210621, 0082_SD165_210621, 0082_SD167_210621, 0082_SD169_210621, 0082_SS171_210621	**21-Jun-2021**	**01-Jul-2021**	28-Jun-2021	×	**01-Jul-2021**	01-Jul-2021	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010)							
0082_SD164_210621, 0082_QC105_210621, 0082_SD165_210621, 0082_SD167_210621, 0082_SD169_210621, 0082_SS171_210621	**21-Jun-2021**	**01-Jul-2021**	28-Jun-2021	×	**01-Jul-2021**	29-Jul-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055)							
0082_SD164_210621, 0082_QC105_210621, 0082_SD165_210621, 0082_SD167_210621, 0082_SD169_210621, 0082_SS171_210621	**21-Jun-2021**	**----**	----	----	**28-Jun-2021**	05-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
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)								
0082_SD164_210621,	0082_QC105_210621,	**21-Jun-2021**	**05-Jul-2021**	19-Jul-2021	✓	**05-Jul-2021**	19-Jul-2021	✓
0082_SD165_210621,	0082_SD167_210621,							
0082_SD169_210621,	0082_SS171_210621							
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0082_SD164_210621,	0082_QC105_210621,	**21-Jun-2021**	**05-Jul-2021**	19-Jul-2021	✓	**05-Jul-2021**	19-Jul-2021	✓
0082_SD165_210621,	0082_SD167_210621,							
0082_SD169_210621,	0082_SS171_210621							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0082_SD164_210621,	0082_QC105_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
0082_SD165_210621,	0082_SD167_210621,							
0082_SD169_210621,	0082_SS171_210621							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
0082_SD164_210621,	0082_QC105_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
0082_SD165_210621,	0082_SD167_210621,							
0082_SD169_210621,	0082_SS171_210621							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
0082_SD164_210621,	0082_QC105_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
0082_SD165_210621,	0082_SD167_210621,							
0082_SD169_210621,	0082_SS171_210621							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0082_SD164_210621,	0082_QC105_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
0082_SD165_210621,	0082_SD167_210621,							
0082_SD169_210621,	0082_SS171_210621							
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)								
0082_SD164_210621,	0082_QC105_210621,	**21-Jun-2021**	**02-Jul-2021**	18-Dec-2021	✓	**02-Jul-2021**	11-Aug-2021	✓
0082_SD165_210621,	0082_SD167_210621,							
0082_SD169_210621,	0082_SS171_210621							

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	10	**10.00**	**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	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	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	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	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	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

ALS COC#: 24435 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: 11:35 24/6/21	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHB GW

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: 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	0082_MW153S		22/06/2021 08:28 AM	Water	ALS: 4 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: 24435 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: ah DEF19009/HEHB GW

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: 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	0082_MW153S	Clear Plastic Bottle - Natural	250 mL	00070519143672	Green	No	
001	0082_MW153S	HDPE (no PTFE)	20 mL	00352005019307	Grey	No	
001	0082_MW153S	HDPE (no PTFE)	20 mL	00352005019774	Grey	No	
001	0082_MW153S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003872	Purple	No	

Total Bottle Count: ALS: 4, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107086**

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	: 24435	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 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)
EP2107086-001	22-Jun-2021 08:28	0082_MW153S_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107086-001	22-Jun-2021 08:28	0082_MW153S_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							
0082_MW153S_2106	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	: **EP2107086**	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	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24435	Issue Date	: 07-Jul-2021 13:04
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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*
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	0082_MW153S_210622	----	----	----	----
			Sampling date / time	22-Jun-2021 08:28	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107086-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.52**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**35400**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**1300**	----	----	----	----
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	**288**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**288**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**2050**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**17200**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**539**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**1240**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**9870**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**560**	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**534**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**572**	----	----	----	----
ø Ionic Balance	----	0.01	%	**3.52**	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**3**	----	----	----	----
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	0082_MW153S_210622	----	----	----	----
				Sampling date / time	22-Jun-2021 08:28	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107086-001	--------	--------	--------	--------
					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	0082_MW153S_210622	----	----	----	----
				Sampling date / time	22-Jun-2021 08:28	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107086-001	--------	--------	--------	--------
					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		<0.05	----	----	----	----
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	%		**96.0**	----	----	----	----
13C8-PFOA	----	0.02	%		**95.6**	----	----	----	----

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	: **EP2107086**	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	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24435	Issue Date	: 07-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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 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%
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	Anonymous	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	Anonymous	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%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761878)									
EP2107086-001	0082_MW153S_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2050	2040	0.3	0% - 20%
EP2107388-007	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	199	198	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761879)									
EP2107086-001	0082_MW153S_210622	ED045G: Chloride	16887-00-6	1	mg/L	17200	17100	0.6	0% - 20%
EP2107388-007	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	306	306	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3760593)									

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	0082_MW153S_210622	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	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	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	13	14	0.0	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3771973)									
EP2107396-014	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.84	2.21	18.4	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.23	0.24	0.0	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.11	0.11	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.57	0.62	8.6	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.02	0.03	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: 3771973)									
EP2107396-014	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.02	0.02	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.31	0.33	5.0	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.49	0.50	3.3	0% - 20%
		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	0.2	0.3	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3771973)									
EP2107396-014	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: 3771973) - continued									
EP2107396-014	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
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3771973)									
EP2107396-014	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: 3771973)									
EP2107396-014	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	3.79	4.38	14.4	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: 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: 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
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761878)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	87.7	113
				<1	500 mg/L	98.6	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3761879)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	98.2	87.9	114
				<1	1000 mg/L	102	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: 3771973)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	85.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	107	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	110	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: 3771973) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	88.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	107	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3771973)								
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	99.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	96.0	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	91.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	97.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	96.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	92.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	95.8	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	99.0	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	85.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	86.9	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3771973)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	100	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	105	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	88.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	93.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	98.0	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	102	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	97.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3771973)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	119	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	110	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	121	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	95.0	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: 3761878)							
EP2107086-001	0082_MW153S_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761879)							
EP2107086-001	0082_MW153S_210622	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	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: 3771973)							
EP2107396-014	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	100	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	81.0	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	83.8	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	87.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3771973)							
EP2107396-014	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	90.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	112	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	110	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	98.6	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	105	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	101	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	98.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	92.8	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	95.6	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	87.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	86.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3771973)							
EP2107396-014	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	101	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	104	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	89.1	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	91.9	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	93.6	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	105	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: 3771973) - continued							
EP2107396-014	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	101	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3771973)							
EP2107396-014	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	114	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	120	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	117	71.4	144

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107086**	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/HEHB	Issue Date	: 07-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 1
Order number	: DEF19009/0082	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

- **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	EP2107086--001	0082_MW153S_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	EP2107086--001	0082_MW153S_210622	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107396--014	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	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						
0082_MW153S_210622	----	----	----	02-Jul-2021	22-Jun-2021	**10**

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	15	6.67	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_MW153S_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	22-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
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0082_MW153S_210622	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	29-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0082_MW153S_210622	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	29-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_MW153S_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	06-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_MW153S_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	20-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_MW153S_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	20-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_MW153S_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_MW153S_210622	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW153S_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW153S_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW153S_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)							
0082_MW153S_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW153S_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	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	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	**6.67**	**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	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	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	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	15	**6.67**	**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	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	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	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	15	**6.67**	**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	1	20	**5.00**	**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
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#: 24431 *ALS Laboratory:* EP Perth

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME: MD 24/6/21 1135	DATE TIME:	DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

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: 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	0082_MW122		22/06/2021 08:11 AM	Water	ALS: 5 Non ALS: 0	No	X		Extra PFAS bottles for lab QC
002	0082_MW152S		22/06/2021 08:37 AM	Water	ALS: 3 Non ALS: 0	No	X		
003	0082_MW022		22/06/2021 01:38 PM	Water	ALS: 5 Non ALS: 0	No	X		

CHAIN OF CUSTODY

COC#: **24431** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: MB DEF19009/HEHB GW

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: 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	0082_MW122	Clear Plastic Bottle - Natural	250 mL	00070519189670	Green	No	
001	0082_MW122	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016591	Purple	No	
001	0082_MW122	HDPE (no PTFE)	20 mL	00350719048817	Grey	No	
001	0082_MW122	HDPE (no PTFE)	20 mL	00350019047548	Grey	No	
002	0082_MW152S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016491	Purple	No	
002	0082_MW152S	Clear Plastic Bottle - Natural	250 mL	00070519189591	Green	No	
002	0082_MW152S	HDPE (no PTFE)	20 mL	00350719048901	Grey	No	
003	0082_MW022	Clear Plastic Bottle - Natural	250 mL	00070220142701	Green	No	
003	0082_MW022	Clear Plastic Bottle - Natural	250 mL	00070220142287	Green	No	
003	0082_MW022	HDPE (no PTFE)	20 mL	00352005019386	Grey	No	
003	0082_MW022	HDPE (no PTFE)	20 mL	00352005019646	Grey	No	
003	0082_MW022	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002510	Purple	No	

Total Bottle Count: ALS: 13, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107092**

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	: 24431	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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)
EP2107092-001	22-Jun-2021 08:11	0082_MW122_210622	✓	✓	✓	✓	✓	✓	✓
EP2107092-002	22-Jun-2021 08:37	0082_MW152S_210622	✓	✓	✓	✓	✓	✓	✓
EP2107092-003	22-Jun-2021 13:38	0082_MW022_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107092-001	22-Jun-2021 08:11	0082_MW122_210622	✓
EP2107092-002	22-Jun-2021 08:37	0082_MW152S_210622	✓
EP2107092-003	22-Jun-2021 13:38	0082_MW022_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							
0082_MW022_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0082_MW122_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0082_MW152S_2106	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	: **EP2107092**	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	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24431	Issue Date	: 06-Jul-2021 08:43
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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
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	0082_MW122_210622	0082_MW152S_210622	0082_MW022_210622	----	----
			Sampling date / time	22-Jun-2021 08:11	22-Jun-2021 08:37	22-Jun-2021 13:38	----	----
Compound	CAS Number	LOR	Unit	EP2107092-001	EP2107092-002	EP2107092-003	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.98**	**7.54**	**8.05**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**5300**	**37600**	**698**	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**565**	**161**	**406**	----	----
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	**687**	**228**	**381**	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**687**	**228**	**381**	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**624**	**2260**	**51**	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**2230**	**18100**	**125**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**28**	**527**	**24**	----	----
Magnesium	7439-95-4	1	mg/L	**61**	**1320**	**23**	----	----
Sodium	7440-23-5	1	mg/L	**1770**	**10600**	**183**	----	----
Potassium	7440-09-7	1	mg/L	**83**	**618**	**36**	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**89.6**	**562**	**12.2**	----	----
ø Total Cations	----	0.01	meq/L	**85.5**	**612**	**12.0**	----	----
ø Ionic Balance	----	0.01	%	**2.34**	**4.23**	**0.95**	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	**5**	**3**	**6**	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	**0.15**	<0.02	**0.09**	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	**0.15**	<0.02	**0.12**	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	**1.34**	<0.02	**1.31**	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	**0.04**	<0.02	**0.07**	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0082_MW122_210622	0082_MW152S_210622	0082_MW022_210622	----	----
			Sampling date / time	22-Jun-2021 08:11	22-Jun-2021 08:37	22-Jun-2021 13:38	----	----
Compound	CAS Number	LOR	Unit	EP2107092-001	EP2107092-002	EP2107092-003	--------	--------
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	**0.32**	<0.01	**3.19**	----	----
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	**0.3**	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	**0.34**	<0.02	**0.88**	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	**0.44**	<0.02	**0.95**	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	**0.17**	<0.02	**0.81**	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	**0.12**	<0.01	**0.56**	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	**0.36**	----	----
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	0082_MW122_210622	0082_MW152S_210622	0082_MW022_210622	----	----
				Sampling date / time	22-Jun-2021 08:11	22-Jun-2021 08:37	22-Jun-2021 13:38	----	----
Compound	CAS Number	LOR	Unit		EP2107092-001	EP2107092-002	EP2107092-003	--------	--------
					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	**0.18**	----	----
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		**3.17**	<0.01	**8.82**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**1.66**	<0.01	**4.50**	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**2.98**	<0.01	**8.27**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**83.3**	**79.8**	**81.3**	----	----
13C8-PFOA	----	0.02	%		**84.5**	**81.3**	**80.3**	----	----

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	: **EP2107092**	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	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24431	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/HEHB		
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	0082_MW152S_210622	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	0082_MW122_210622	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	0082_MW122_210622	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	0082_MW152S_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	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: 3761878)									
EP2107086-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2050	2040	0.3	0% - 20%
EP2107388-007	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	199	198	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761879)									
EP2107086-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	17200	17100	0.6	0% - 20%
EP2107388-007	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	306	306	0.0	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	Anonymous	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: 3761878)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	87.7	113
				<1	500 mg/L	98.6	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3761879)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	98.2	87.9	114
				<1	1000 mg/L	102	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: 3761878)							
EP2107086-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761879)							
EP2107086-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	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

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: 3769045) - continued							
EP2107095-007	Anonymous	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	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	: **EP2107092**	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	: 24-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 3
Order number	: DEF19009/0082	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	EP2107086--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	EP2107086--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							
0082_MW122_210622, 0082_MW022_210622	0082_MW152S_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)								
0082_MW122_210622, 0082_MW022_210622	0082_MW152S_210622,	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	22-Jun-2021	×
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0082_MW122_210622, 0082_MW022_210622	0082_MW152S_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)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	06-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	20-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	20-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_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)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_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
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW122_210622, 0082_MW152S_210622, 0082_MW022_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	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	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	20	**10.00**	**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	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	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	20	**10.00**	**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	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	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
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	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#: **24434** *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

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: 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	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0082_MW147		22/06/2021 08:27 AM	Water	ALS: 5 Non ALS: 0	No	X			
002	0082_QC107		22/06/2021 08:27 AM	Water	ALS: 4 Non ALS: 1	No	X			
003	0082_QC401		22/06/2021 04:36 PM	Water	ALS: 2 Non ALS: 0	No		X		
004	0082_QC301		22/06/2021 04:37 PM	Water	ALS: 2 Non ALS: 0	No		X		
005	0082_QC303		22/06/2021 04:37 PM	Water	ALS: 2 Non ALS: 0	No		X		
006	0082_QC402		22/06/2021 04:38 PM	Water	ALS: 2 Non ALS: 0	No		X		
007	0082_QC302		22/06/2021 04:38 PM	Water	ALS: 2 Non ALS: 0	No		X		
008	0082_QC403		22/06/2021 04:39 PM	Water	ALS: 2 Non ALS: 0	No		X		

CHAIN OF CUSTODY

(ALS) COC#: **24434** *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0082_PFASOMP

SITE: SC-DEF19009/HEHB GW

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: 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	0082_MW147	Clear Plastic Bottle - Natural	250 mL	00070220186502	Green	No	
001	0082_MW147	Clear Plastic Bottle - Natural	250 mL	00070220186671	Green	No	
001	0082_MW147	HDPE (no PTFE)	20 mL	00352005019780	Grey	No	
001	0082_MW147	HDPE (no PTFE)	20 mL	00352005019427	Grey	No	
001	0082_MW147	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020017354	Purple	No	
002	0082_QC107	Clear Plastic Bottle - Natural	250 mL	00070220186385	Green	No	
002	0082_QC107	Clear Plastic Bottle - Natural	250 mL	00070220186618	Green	No	
002	0082_QC107	HDPE (no PTFE)	20 mL	00352005019695	Grey	No	
002	0082_QC107	HDPE (no PTFE)	20 mL	00352005019779	Grey	No	
003	0082_QC401	HDPE (no PTFE)	20 mL	00352010058964	Grey	No	
003	0082_QC401	HDPE (no PTFE)	20 mL	00352010059115	Grey	No	
004	0082_QC301	HDPE (no PTFE)	20 mL	00352010059031	Grey	No	
004	0082_QC301	HDPE (no PTFE)	20 mL	00352010058861	Grey	No	
005	0082_QC303	HDPE (no PTFE)	20 mL	00352010059131	Grey	No	
005	0082_QC303	HDPE (no PTFE)	20 mL	00352010059104	Grey	No	
006	0082_QC402	HDPE (no PTFE)	20 mL	00352010058988	Grey	No	
006	0082_QC402	HDPE (no PTFE)	20 mL	00352010059099	Grey	No	
007	0082_QC302	HDPE (no PTFE)	20 mL	00352010059130	Grey	No	
007	0082_QC302	HDPE (no PTFE)	20 mL	00352010058986	Grey	No	
008	0082_QC403	HDPE (no PTFE)	20 mL	00352010058924	Grey	No	
008	0082_QC403	HDPE (no PTFE)	20 mL	00352010058998	Grey	No	

Total Bottle Count: ALS: 21, Non ALS: 1

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2107183**

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	: 24434	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/HEHB		
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	: 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	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)
EP2107183-001	22-Jun-2021 08:27	0082_MW147_210622	✓	✓	✓	✓	✓	✓	✓
EP2107183-002	22-Jun-2021 08:27	0082_QC107_210622	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107183-001	22-Jun-2021 08:27	0082_MW147_210622	✓
EP2107183-002	22-Jun-2021 08:27	0082_QC107_210622	✓
EP2107183-003	22-Jun-2021 16:36	0082_QC401_210622	✓
EP2107183-004	22-Jun-2021 16:37	0082_QC301_210622	✓
EP2107183-005	22-Jun-2021 16:37	0082_QC303_210622	✓
EP2107183-006	22-Jun-2021 16:38	0082_QC402_210622	✓
EP2107183-007	22-Jun-2021 16:38	0082_QC302_210622	✓
EP2107183-008	22-Jun-2021 16:39	0082_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 Date	Samples Received Evaluation	Instructions Received Date	Instructions Received Evaluation
EA005-P: pH by PC Titrator							
0082_MW147_21062	Clear Plastic Bottle - Natural	----	22-Jun-2021	24-Jun-2021	×	----	----
0082_QC107_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	: **EP2107183**	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 11:35
Order number	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24434	Issue Date	: 06-Jul-2021 08:44
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
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 #1 and #2 have been visually inspected and have differing sediment loading, please scrutinise suspended solids results 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	0082_MW147_210622	0082_QC107_210622	0082_QC401_210622	0082_QC301_210622	0082_QC303_210622
			Sampling date / time	22-Jun-2021 08:27	22-Jun-2021 08:27	22-Jun-2021 16:36	22-Jun-2021 16:37	22-Jun-2021 16:37
Compound	CAS Number	LOR	Unit	EP2107183-001	EP2107183-002	EP2107183-003	EP2107183-004	EP2107183-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.63	7.52	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	26600	26400	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	12100	8040	----	----	----
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	306	313	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	306	313	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1390	1390	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12500	12400	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	501	517	----	----	----
Magnesium	7439-95-4	1	mg/L	869	897	----	----	----
Sodium	7440-23-5	1	mg/L	6880	7080	----	----	----
Potassium	7440-09-7	1	mg/L	346	353	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	388	385	----	----	----
ø Total Cations	----	0.01	meq/L	405	417	----	----	----
ø Ionic Balance	----	0.01	%	2.14	3.95	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	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)				Sample ID	0082_MW147_210622	0082_QC107_210622	0082_QC401_210622	0082_QC301_210622	0082_QC303_210622
				Sampling date / time	22-Jun-2021 08:27	22-Jun-2021 08:27	22-Jun-2021 16:36	22-Jun-2021 16:37	22-Jun-2021 16:37
Compound	CAS Number	LOR	Unit		EP2107183-001	EP2107183-002	EP2107183-003	EP2107183-004	EP2107183-005
					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)				Sample ID	0082_MW147_210622	0082_QC107_210622	0082_QC401_210622	0082_QC301_210622	0082_QC303_210622
				Sampling date / time	22-Jun-2021 08:27	22-Jun-2021 08:27	22-Jun-2021 16:36	22-Jun-2021 16:37	22-Jun-2021 16:37
Compound	CAS Number	LOR	Unit		EP2107183-001	EP2107183-002	EP2107183-003	EP2107183-004	EP2107183-005
					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	%		**81.2**	**80.5**	**81.6**	**79.8**	**83.1**
13C8-PFOA	----	0.02	%		**80.4**	**79.7**	**77.6**	**82.4**	**83.3**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_QC402_210622	0082_QC302_210622	0082_QC403_210622	----	----
				Sampling date / time	22-Jun-2021 16:38	22-Jun-2021 16:38	22-Jun-2021 16:39	----	----
Compound	CAS Number	LOR	Unit		EP2107183-006	EP2107183-007	EP2107183-008	--------	--------
					Result	Result	Result	----	----
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	----	----
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	----	----

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0082_QC402_210622	0082_QC302_210622	0082_QC403_210622	----	----
				Sampling date / time	22-Jun-2021 16:38	22-Jun-2021 16:38	22-Jun-2021 16:39	----	----
Compound	CAS Number	LOR	Unit		EP2107183-006	EP2107183-007	EP2107183-008	--------	--------
					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	----	----
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	----	----
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	%		**81.3**	**78.0**	**82.3**	----	----
13C8-PFOA	----	0.02	%		**78.4**	**81.1**	**82.3**	----	----

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	: **EP2107183**	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	: DEF19009/0082	Date Analysis Commenced	: 25-Jun-2021
C-O-C number	: 24434	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/HEHB		
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 (%)*	*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	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: 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: 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	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: 3761875)									
EP2107183-001	0082_MW147_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1390	1420	1.9	0% - 20%
EP2107348-009	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	537	538	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761876)									
EP2107183-001	0082_MW147_210622	ED045G: Chloride	16887-00-6	1	mg/L	12500	12600	0.9	0% - 20%
EP2107348-009	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	5160	5160	0.1	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: 3758252)									
EP2107095-010	Anonymous	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

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: 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: 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: 3761875)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	105	87.7	113
				<1	500 mg/L	99.1	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3761876)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	98.9	87.9	114
				<1	1000 mg/L	99.9	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: 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: 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

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: 3770204) - continued								
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
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
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
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

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: 3761875)							
EP2107183-001	0082_MW147_210622	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761876)							
EP2107183-001	0082_MW147_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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107183**	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	: 24-Jun-2021
Site	: DEF19009/HEHB	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 8
Order number	: DEF19009/0082	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	EP2107183--001	0082_MW147_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	EP2107183--001	0082_MW147_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							
0082_MW147_210622,	0082_QC107_210622	----	----	----	02-Jul-2021	22-Jun-2021	**10**

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	19	0.00	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
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	22-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
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**02-Jul-2021**	06-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**01-Jul-2021**	20-Jul-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**01-Jul-2021**	20-Jul-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**29-Jun-2021**	29-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0082_MW147_210622,	0082_QC107_210622	**22-Jun-2021**	**----**	----	----	**25-Jun-2021**	20-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0082_MW147_210622,	0082_QC107_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0082_QC401_210622,	0082_QC301_210622,							
0082_QC303_210622,	0082_QC402_210622,							
0082_QC302_210622,	0082_QC403_210622							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0082_MW147_210622,	0082_QC107_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0082_QC401_210622,	0082_QC301_210622,							
0082_QC303_210622,	0082_QC402_210622,							
0082_QC302_210622,	0082_QC403_210622							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0082_MW147_210622,	0082_QC107_210622,	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
0082_QC401_210622,	0082_QC301_210622,							
0082_QC303_210622,	0082_QC402_210622,							
0082_QC302_210622,	0082_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
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
0082_MW147_210622, 0082_QC107_210622, 0082_QC401_210622, 0082_QC301_210622, 0082_QC303_210622, 0082_QC402_210622, 0082_QC302_210622, 0082_QC403_210622	**22-Jun-2021**	**05-Jul-2021**	19-Dec-2021	✓	**05-Jul-2021**	19-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
0082_MW147_210622, 0082_QC107_210622, 0082_QC401_210622, 0082_QC301_210622, 0082_QC303_210622, 0082_QC402_210622, 0082_QC302_210622, 0082_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	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	16	**12.50**	**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	20	**10.00**	**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	16	**12.50**	**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	20	**10.00**	**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	16	**6.25**	**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	20	**5.00**	**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	16	**6.25**	**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	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 RECORD

Eurofins | Environment Testing ABN 50 005 085 521

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☐ **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-B	**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	DEF19009/630				
Quote ID №					

Sampler(s)	AH, SC, MB
Handed over by	~~AES~~ TOLL
Email for Invoice	~~claire.armstrong~~@cardno.com.au laura.barnes
Email for Results	maelle.bourdais@cardno.com.au derp.labreports@esdat.com.au

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	[redacted], TSS, TDS, [redacted]	(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	0082_QC201_210621	21-06-21	W	X	X	X										
2	0082_QC202_210621	21-06-21	S	X			X									
3	0082_QC203_210621	21-6-21	W	X	X	X										
4	0082-QC204_2106-21	21-6-21	W	X	X	X										
5	0082_QC205_210621	21-6-21	S	X			X									
6	0082_QC206_210621	21_6-21	W	X	X	X										
7	0082_QC207_2106 22	22-6-21	W	X	X	X										
8																
9																
10																
	Total Counts															

Date/Time 24/6/21 10:00
Temp: 8.1 8.7 16.6 -10.2 8.9°C
Correction:
Final Temp:

Method of Shipment ☒ Courier (#) ☐ Hand Delivered ☐ Postal Name Signature Date Time

Laboratory Use Only							
Received By	Rob Johnson	SYD | BNE | MEL | (PER) | ADL | NTL | DRW	Signature		Date 24/6/21	Time 10:00	Temperature 8.9°C
Received By		SYD | BNE | MEL | PER | ADL | NTL | DRW	Signature		Date	Time	Report № 805490

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

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Rolleston, Christchurch 7675
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IANZ # 1290

Sample Receipt Advice

Company name:	Cardno (WA)
Contact name:	Maelle Bourdais
Project name:	HEH-B
Project ID:	WA_0082_PFASOMP
Turnaround time:	5 Day
Date/Time received	Jun 24, 2021 10:00 AM
Eurofins reference	805490

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

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Phone : 0800 856 450
IANZ # 1290

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

Project Name: HEH-B
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/630
Report #: 805490
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.)	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
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	0082_QC201_210621	Jun 21, 2021		Water	P21-Jn48654			X			X	X	X	X
2	0082_QC202_210621	Jun 21, 2021		Soil	P21-Jn48655	X	X		X	X		X		
3	0082_QC203_210621	Jun 21, 2021		Water	P21-Jn48656			X			X	X	X	X
4	0082_QC204_210621	Jun 21, 2021		Water	P21-Jn48657			X			X	X	X	X
5	0082_QC205_210621	Jun 21, 2021		Soil	P21-Jn48658	X	X		X	X		X		
6	0082_QC206_	Jun 21, 2021		Water	P21-Jn48659			X			X	X	X	X

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Company Name: Cardno (WA)
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WA 6005

Project Name: HEH-B
Project ID: WA_0082_PFASOMP

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Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	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
Sydney Laboratory - NATA Site # 18217														
Brisbane Laboratory - NATA Site # 20794												X		
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory - NATA Site # 25079														
External Laboratory														
	210621													
7	0082_QC207_210621	Jun 21, 2021		Water	P21-Jn48660			X			X	X	X	X
Test Counts						2	2	5	2	2	5	7	5	5

Cardno Consulting WA
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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 **805490-S**
Project name HEH-B
Project ID WA_0082_PFASOMP
Received Date Jun 24, 2021

Client Sample ID			**0082_QC202_210621**	**0082_QC205_210621**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**P21-Jn48655**	**P21-Jn48658**
Date Sampled			**Jun 21, 2021**	**Jun 21, 2021**
Test/Reference	LOR	Unit		
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	760	43
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	9.1	7.8
Total Organic Carbon	0.1	%	< 0.1	0.2
% Moisture	1	%	27	5.0
Cation Exchange Capacity				
Cation Exchange Capacity	0.05	meq/100g	27	6.4
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5
Perfluorodecanoic acid (PFDA)[N11]	5	ug/kg	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)[N11]	5	ug/kg	< 5	< 5
Perfluorododecanoic acid (PFDoDA)[N11]	5	ug/kg	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)[N15]	5	ug/kg	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)[N11]	5	ug/kg	< 5	< 5
13C4-PFBA (surr.)	1	%	62	87
13C5-PFPeA (surr.)	1	%	78	82
13C5-PFHxA (surr.)	1	%	75	91
13C4-PFHpA (surr.)	1	%	76	87
13C8-PFOA (surr.)	1	%	75	87
13C5-PFNA (surr.)	1	%	84	88
13C6-PFDA (surr.)	1	%	95	104
13C2-PFUnDA (surr.)	1	%	114	131
13C2-PFDoDA (surr.)	1	%	125	130
13C2-PFTeDA (surr.)	1	%	104	114
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA)[N11]	5	ug/kg	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)[N11]	5	ug/kg	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	5	ug/kg	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	5	ug/kg	< 5	< 5

Client Sample ID			0082_QC202_210621	0082_QC205_210621
Sample Matrix			Soil	Soil
Eurofins Sample No.			P21-Jn48655	P21-Jn48658
Date Sampled			Jun 21, 2021	Jun 21, 2021
Test/Reference	LOR	Unit		
Perfluoroalkyl sulfonamido substances				
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	5	ug/kg	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	10	ug/kg	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	10	ug/kg	< 10	< 10
13C8-FOSA (surr.)	1	%	83	89
D3-N-MeFOSA (surr.)	1	%	87	92
D5-N-EtFOSA (surr.)	1	%	85	93
D7-N-MeFOSE (surr.)	1	%	94	108
D9-N-EtFOSE (surr.)	1	%	100	109
D5-N-EtFOSAA (surr.)	1	%	93	117
D3-N-MeFOSAA (surr.)	1	%	119	131
Perfluoroalkyl sulfonic acids (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)[N11]	5	ug/kg	< 5	< 5
Perfluorononanesulfonic acid (PFNS)[N15]	5	ug/kg	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)[N15]	5	ug/kg	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)[N15]	5	ug/kg	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)[N11]	5	ug/kg	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)[N15]	5	ug/kg	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5	< 5
Perfluorodecanesulfonic acid (PFDS)[N15]	5	ug/kg	< 5	< 5
13C3-PFBS (surr.)	1	%	81	86
18O2-PFHxS (surr.)	1	%	92	88
13C8-PFOS (surr.)	1	%	78	84
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	10	ug/kg	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	5	ug/kg	< 5	< 5
13C2-4:2 FTS (surr.)	1	%	48	103
13C2-6:2 FTSA (surr.)	1	%	62	92
13C2-8:2 FTSA (surr.)	1	%	90	119
13C2-10:2 FTSA (surr.)	1	%	98	90
PFASs Summations				
Sum (PFHxS + PFOS)*	5	ug/kg	< 5	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 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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Melbourne Laboratory - NATA Site # 1254						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	0082_QC201_210621	Jun 21, 2021		Water	P21-Jn48654			X			X	X	X	X
2	0082_QC202_210621	Jun 21, 2021		Soil	P21-Jn48655	X	X		X	X		X		
3	0082_QC203_210621	Jun 21, 2021		Water	P21-Jn48656			X			X	X	X	X
4	0082_QC204_210621	Jun 21, 2021		Water	P21-Jn48657			X			X	X	X	X
5	0082_QC205_210621	Jun 21, 2021		Soil	P21-Jn48658	X	X		X	X		X		
6	0082_QC206_	Jun 21, 2021		Water	P21-Jn48659			X			X	X	X	X

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Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	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
Sydney Laboratory - NATA Site # 18217														
Brisbane Laboratory - NATA Site # 20794												X		
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory - NATA Site # 25079														
External Laboratory														
	210621													
7	0082_QC207_210621	Jun 21, 2021		Water	P21-Jn48660			X			X	X	X	X
Test Counts						2	2	5	2	2	5	7	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							
Total Organic Carbon	%	101			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	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoroheptanoic acid (PFHpA)	%	90			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	86			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	93			50-150	Pass	
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	NCP	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48729	NCP	%	76			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48729	NCP	%	88			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48729	NCP	%	81			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48729	NCP	%	88			50-150	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48729	NCP	%	90			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48729	NCP	%	88			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48729	NCP	%	87			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48729	NCP	%	84			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48729	NCP	%	75			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48729	NCP	%	97			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	P21-Jn48729	NCP	%	88			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)	P21-Jn48729	NCP	%	88			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48729	NCP	%	84			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48729	NCP	%	88			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48729	NCP	%	94			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48729	NCP	%	84			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48729	NCP	%	84			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48729	NCP	%	82			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48729	NCP	%	86			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48729	NCP	%	83			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48729	NCP	%	80			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48729	NCP	%	85			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48729	NCP	%	79			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48729	NCP	%	86			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48729	NCP	%	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	NCP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48729	NCP	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48729	NCP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48729	NCP	%	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									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Cation Exchange Capacity	M21-Jn59835	NCP	meq/100g	5.8	5.3	9.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorodecanoic acid (PFDA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48658	CP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48658	CP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48658	CP	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	CP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48658	CP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48658	CP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48658	CP	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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West Perth
WA 6005

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Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
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Attention: **Maelle Bourdais**

Report **805490-W-V3**
Project name HEH-B
Project ID WA_0082_PFASOMP
Received Date Jun 24, 2021

Client Sample ID			**0082_QC201_210621**	**0082_QC203_210621**	**0082_QC204_210621**	**0082_QC206_210621**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**P21-Jn48654**	**P21-Jn48656**	**P21-Jn48657**	**P21-Jn48659**
Date Sampled			**Jun 21, 2021**	**Jun 21, 2021**	**Jun 21, 2021**	**Jun 21, 2021**
Test/Reference	LOR	Unit				
Chloride	1	mg/L	3100	1500	2000	19000
Sulphate (as SO4)	5	mg/L	500	200	180	3000
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	6700	3400	5400	25000
Total Suspended Solids Dried at 103–105°C	1	mg/L	28	530	210	440
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	87	600	310	660
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	87	600	310	660
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	0.5	mg/L	130	140	230	550
Magnesium	0.5	mg/L	250	140	170	1100
Potassium	0.5	mg/L	87	48	21	390
Sodium	0.5	mg/L	2100	790	740	11000
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA)[N11]	0.05	ug/L	< 0.05	2.2	0.18	< 0.05
Perfluoropentanoic acid (PFPeA)[N11]	0.01	ug/L	< 0.01	4.6	0.18	< 0.01
Perfluorohexanoic acid (PFHxA)[N11]	0.01	ug/L	< 0.01	4.1	[N09]0.67	< 0.01
Perfluoroheptanoic acid (PFHpA)[N11]	0.01	ug/L	< 0.01	1.6	[N09]0.07	< 0.01
Perfluorooctanoic acid (PFOA)[N11]	0.01	ug/L	< 0.01	[N09]0.78	[N09]0.06	< 0.01
Perfluorononanoic acid (PFNA)[N11]	0.01	ug/L	< 0.01	0.15	< 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	%	67	127	72	83
13C5-PFPeA (surr.)	1	%	111	94	89	106
13C5-PFHxA (surr.)	1	%	134	89	79	112
13C4-PFHpA (surr.)	1	%	135	72	90	103
13C8-PFOA (surr.)	1	%	127	74	85	101
13C5-PFNA (surr.)	1	%	107	81	85	96
13C6-PFDA (surr.)	1	%	73	17	53	80
13C2-PFUnDA (surr.)	1	%	53	41	54	71
13C2-PFDoDA (surr.)	1	%	24	27	29	50
13C2-PFTeDA (surr.)	1	%	INT	INT	INT	INT

Client Sample ID			0082_QC201_210621	0082_QC203_210621	0082_QC204_210621	0082_QC206_210621
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn48654	P21-Jn48656	P21-Jn48657	P21-Jn48659
Date Sampled			Jun 21, 2021	Jun 21, 2021	Jun 21, 2021	Jun 21, 2021
Test/Reference	LOR	Unit				
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	0.11	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)[N11]	0.05	ug/L	< 0.05	0.17	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)[N11]	0.05	ug/L	< 0.05	0.07	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)[N11]	0.05	ug/L	< 0.05	0.10	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)[N11]	0.05	ug/L	< 0.05	0.33	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)[N11]	0.05	ug/L	< 0.05	0.16	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	68	75	77	78
D3-N-MeFOSA (surr.)	1	%	30	63	41	62
D5-N-EtFOSA (surr.)	1	%	28	47	34	57
D7-N-MeFOSE (surr.)	1	%	17	41	21	30
D9-N-EtFOSE (surr.)	1	%	13	30	17	26
D5-N-EtFOSAA (surr.)	1	%	19	18	23	55
D3-N-MeFOSAA (surr.)	1	%	24	24	25	60
Perfluoroalkyl sulfonic acids (PFSAs)						
Perfluorobutanesulfonic acid (PFBS)[N11]	0.01	ug/L	< 0.01	0.46	0.26	< 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	0.28	0.13	< 0.01
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.01	ug/L	< 0.01	[N09]0.51	[N09]0.32	< 0.01
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.01	ug/L	< 0.01	[N09]3.6	[N09]2.7	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01	[N09]0.63	[N09]0.06	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01	[N09]60	[N09]2.9	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	107	72	85	104
18O2-PFHxS (surr.)	1	%	98	87	80	96
13C8-PFOS (surr.)	1	%	79	69	72	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	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)[N11]	0.05	ug/L	< 0.05	4.7	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.01	ug/L	< 0.01	0.02	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.01	ug/L	< 0.01	1.8	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	94	128	70	31
13C2-6:2 FTSA (surr.)	1	%	102	99	70	30
13C2-8:2 FTSA (surr.)	1	%	80	67	74	56
13C2-10:2 FTSA (surr.)	1	%	21	1.0	27	37
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	63.6	5.6	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	60.78	2.96	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	64.38	5.66	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	82.06	7.02	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	86.37	7.53	< 0.1

Client Sample ID			0082_QC207_210622
Sample Matrix			Water
Eurofins Sample No.			P21-Jn48660
Date Sampled			Jun 22, 2021
Test/Reference	LOR	Unit	
Chloride	1	mg/L	12000
Sulphate (as SO4)	5	mg/L	1700
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	25000
Total Suspended Solids Dried at 103–105°C	1	mg/L	1000
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	2900
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20
Total Alkalinity (as CaCO3)	20	mg/L	2900
Eurofins Suite B11C: Na/K/Ca/Mg			
Calcium	0.5	mg/L	420
Magnesium	0.5	mg/L	760
Potassium	0.5	mg/L	220
Sodium	0.5	mg/L	6900
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	< 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	%	91
13C5-PFPeA (surr.)	1	%	115
13C5-PFHxA (surr.)	1	%	119
13C4-PFHpA (surr.)	1	%	103
13C8-PFOA (surr.)	1	%	106
13C5-PFNA (surr.)	1	%	99
13C6-PFDA (surr.)	1	%	78
13C2-PFUnDA (surr.)	1	%	71
13C2-PFDoDA (surr.)	1	%	43
13C2-PFTeDA (surr.)	1	%	INT
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	%	78

Client Sample ID			0082_QC207_210622
Sample Matrix			**Water**
Eurofins Sample No.			**P21-Jn48660**
Date Sampled			**Jun 22, 2021**
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
D3-N-MeFOSA (surr.)	1	%	61
D5-N-EtFOSA (surr.)	1	%	57
D7-N-MeFOSE (surr.)	1	%	31
D9-N-EtFOSE (surr.)	1	%	26
D5-N-EtFOSAA (surr.)	1	%	69
D3-N-MeFOSAA (surr.)	1	%	67
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	< 0.01
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	< 0.01
Perfluorodecanesulfonic acid (PFDS)[N15]	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	107
18O2-PFHxS (surr.)	1	%	98
13C8-PFOS (surr.)	1	%	90
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	%	50
13C2-6:2 FTSA (surr.)	1	%	63
13C2-8:2 FTSA (surr.)	1	%	80
13C2-10:2 FTSA (surr.)	1	%	39
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 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			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Jun 25, 2021	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
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			
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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Company Name: Cardno (WA)
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WA 6005

Project Name: HEH-B
Project ID: WA_0082_PFASOMP

Order No.: DEF19009/630
Report #: 805490
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.)	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
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	0082_QC201_210621	Jun 21, 2021		Water	P21-Jn48654			X			X	X	X	X
2	0082_QC202_210621	Jun 21, 2021		Soil	P21-Jn48655	X	X		X	X		X		
3	0082_QC203_210621	Jun 21, 2021		Water	P21-Jn48656			X			X	X	X	X
4	0082_QC204_210621	Jun 21, 2021		Water	P21-Jn48657			X			X	X	X	X
5	0082_QC205_210621	Jun 21, 2021		Soil	P21-Jn48658	X	X		X	X		X		
6	0082_QC206_	Jun 21, 2021		Water	P21-Jn48659			X			X	X	X	X

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Order No.: DEF19009/630
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Phone: 08 9273 3888
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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.)	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
Sydney Laboratory - NATA Site # 18217														
Brisbane Laboratory - NATA Site # 20794												X		
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory - NATA Site # 25079														
External Laboratory														
	210621													
7	0082_QC207_210622	Jun 22, 2021		Water	P21-Jn48660			X			X	X	X	X
Test Counts						2	2	5	2	2	5	7	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							
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	%	98			70-130	Pass	
Sulphate (as SO4)	%	99			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	103			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	93			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	76			70-130	Pass	
Total Alkalinity (as CaCO3)	%	77			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	101			80-120	Pass	
Magnesium	%	101			80-120	Pass	
Potassium	%	100			80-120	Pass	
Sodium	%	105			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	M21-Jn51297	NCP	%	78			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	B21-Jn48849	NCP	%	94			75-125	Pass	
Magnesium	B21-Jn48849	NCP	%	92			75-125	Pass	
Potassium	B21-Jn48867	NCP	%	87			75-125	Pass	
Sodium	B21-Jn48867	NCP	%	96			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	P21-Jn48731	NCP	%	105			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48731	NCP	%	106			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48731	NCP	%	111			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48731	NCP	%	108			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48731	NCP	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48731	NCP	%	115			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48731	NCP	%	120			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48731	NCP	%	112			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48731	NCP	%	111			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48731	NCP	%	75			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48731	NCP	%	122			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	P21-Jn48731	NCP	%	112			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48731	NCP	%	121			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48731	NCP	%	114			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48731	NCP	%	120			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48731	NCP	%	123			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48731	NCP	%	116			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48731	NCP	%	120			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48731	NCP	%	100			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48731	NCP	%	97			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48731	NCP	%	106			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48731	NCP	%	111			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48731	NCP	%	106			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48731	NCP	%	116			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48731	NCP	%	105			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48731	NCP	%	68			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-Jn48731	NCP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48731	NCP	%	127			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48731	NCP	%	87			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48731	NCP	%	115			50-150	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	
Sulphate (as SO4)	P21-Jn48935	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	M21-Jn48542	NCP	mg/L	620	710	13	30%	Pass	
Total Suspended Solids Dried at 103–105°C	M21-Jn51297	NCP	mg/L	46	48	4.0	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M21-Jn48542	NCP	mg/L	84	72	15	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M21-Jn48542	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	M21-Jn48542	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	M21-Jn48542	NCP	mg/L	88	75	16	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	B21-Jn48849	NCP	mg/L	61	70	14	30%	Pass	
Magnesium	B21-Jn48849	NCP	mg/L	46	46	<1	30%	Pass	
Potassium	B21-Jn48867	NCP	mg/L	15	16	4.0	30%	Pass	
Sodium	B21-Jn48867	NCP	mg/L	120	130	2.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48660	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-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48660	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48660	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Comments

V3 report issued with corrected client ID and sampling date.

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

Monitoring Date	Monitoring Location	Sample_ID	Bore Type	TOC (mAHD)	Well Depth (m)	Screen Interval (mbgl)	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	MW022	0082_MW022_210622	Single_Level	6.675	7	4-7_	13:36	5.7	0.975		HydroSleeve	28.1	1.99	899	585	7.97	96			Brown,Cloudy
21/06/2021	MW103D	0082_MW103D_210621	Single_Level	9.3778	14.28	11-15_	12:16	8.445	0.933		HydroSleeve	27	1.55	5535	3594.5	7.22	88.6	QC104, QC204		Clear
21/06/2021	MW105S	0082_MW105S_210621	Single_Level	3.8438	4.42	2-4_	13:43	2.92	0.924		HydroSleeve	25.1	1.64	5248	3412.5	7.57	-35		Organic	Cloudy,Black
21/06/2021	MW109	0082_MW109_210621	Single_Level	5.627	10	4-10_	15:28	3.71	1.917		HydroSleeve	23.5	4.69	473.45	306.8	7.87	100.6			Brown
21/06/2021	MW113	0082_MW113_210621	Single_Level	6.6842	8.67	4.5-9.5_	13:23	5.74	0.944		HydroSleeve	27.1	0.75	3591	2333.5	7.7	40.8			Clear,Brown
21/06/2021	MW115	0082_MW115_210621	Single_Level	7.7258	8.65	4.3-10.3_	12:45	6.785	0.941		HydroSleeve	27.4	0.88	5254	3412.5	7.27	-181.1		Organic	Clear,Black
21/06/2021	MW118D	0082_MW118D_210621	Single_Level	6.2622	11.5	7.5-11.5_	13:34	5.21	1.052		HydroSleeve	21.9	3.04	9790	6370	7.91	91.8			Clear
22/06/2021	MW122	0082_MW122_210622	Single_Level	5.0782	8.5	3.5-8.5_	08:01	4.15	0.928		HydroSleeve	25.6	1.34	9340	6071	7.67	113.4			Cloudy
21/06/2021	MW126	0082_MW126_210621	Single_Level	4.8325	8.5	4.5-8.5_	12:43	3.845	0.987		HydroSleeve	22.9	8.48	2394	1553.5	7.65	95			Clear
21/06/2021	MW128	0082_MW128_210621	Multi_level	2.5435	3.68	3.7-4.2_	10:57	2.13	0.414	Not field filtered	Peristaltic Pump	26.3	2.05	52736		7.35	68.7			Brown
21/06/2021	MW129	0082_MW129_3.5-4_210621	Multi_level	2.5311	4	3.5-4_	11:44	1.855	0.676	Not enough water for DOC	Peristaltic Pump	24.9	3.82	56175		7.69				Clear
21/06/2021	MW130	0082_MW130_6.9-7.4_210621	Multi_level	2.4665	7.4	6.9-7.4_	12:07	1.695	0.771		Peristaltic Pump	26.2	1.77	27552		7.51	106.7			Clear
21/06/2021	MW131	0082_MW131_4-4.5_210621	Multi_level	2.8774	4.5	4-4.5_	12:54	2.06	0.817		Peristaltic Pump	25	4.61	2406		8.82	73			Cloudy
21/06/2021	MW132	0082_MW132_8.5-9_210621	Multi_level	5.4383	9	8.5-9_	13:48	4.78	0.658	Not enough water for DOC	Peristaltic Pump	25.3	3.04	52310		7.68	117.5			Cloudy
21/06/2021	MW133	0082_MW133_3-3.5_210621	Multi_level	2.1505	3.5	3-3.5_	15:37	2.06	0.091		Peristaltic Pump	25.4	2.65	11951		7.85	37.7			Cloudy
21/06/2021	MW134	0082_MW134_8.6-9.1_210621	Multi_level	6.5308	9.1	8.6-9.1_	15:45	5.95	0.581		Peristaltic Pump	23.9	2.42	41780	27196	7.04	43.5			Cloudy
21/06/2021	MW135	0082_MW135_210621	Multi_level	9.301	9.3	10.3-10.8_	16:09	8.57	0.731		Peristaltic Pump	27.3	1.2	25098	6302	7.33	33.6			Cloudy,Brown
21/06/2021	MW137	0082_MW137_8.1-8.6_210621	Multi_level	5.3907	8.6	8.1-8.6_	15:06	4.3	1.091		Peristaltic Pump	27.9	1.34	21137		7.23	-6.7			Cloudy
21/06/2021	MW142	0082_MW142_210621	Single_Level	7.5281	9.945	4.5-10.5_	11:46	6.435	1.093		HydroSleeve	25.9	1.2	5796	3770	7	143.8	QC103, QC203		Clear,Brown
21/06/2021	MW143	0082_MW143_210621	Single_Level	10.5204	11.9	7-13_	13:02	9.63	0.89		HydroSleeve	26.2	2.1	1611	1046.5	8.12	0.3			Clear
21/06/2021	MW144S	0082_MW144S_210621	Single_Level	6.0715	8	2-8_	12:28	5.12	0.952		HydroSleeve	22.7	3.73	1569	1020.5	7.95	94.3			Clear
21/06/2021	MW145	0082_MW145_210621	Single_Level	3.8644	6.94	0.9-6.9_	14:11	3.04	0.824		HydroSleeve	25.1	2.79	53180	34580	7.12	105.8	QC106, QC206		Cloudy,Brown
22/06/2021	MW147	0082_MW147_210622	Single_Level	5.51	7.9	4.5-8.5	08:00	4.96	0.55		HydroSleeve	21.4	1.38	36568	23777	7.04	-52.5	QC107, QC207	Mild hydrocarbon	Cloudy,Green
21/06/2021	MW148S	0082_MW148S_210621	Single_Level	5.7648	9	3-9_	16:24	5.2	0.565		HydroSleeve	24	1.97	35.983	23393.5	7.01	-43.5			Clear
21/06/2021	MW151S	0082_MW151S_210621	Single_Level	3.4	5	1-5_	11:35	2.52	0.88		HydroSleeve	28.3	2.11	28714		7.27	91.8			Clear
22/06/2021	MW152S	0082_MW152S_210622	Single_Level	3.4103	6.5	2.5-6.5_	08:27	2.53	0.88		HydroSleeve	27.3	1.03	51252	33410	7.39	140			Cloudy
22/06/2021	MW153S	0082_MW153S_210622	Single_Level	4.7872	6	2-6_	08:27	3.885	0.902		HydroSleeve	20.3	2.77	49053	31882.5	7.22	81.4			Cloudy
21/06/2021	MW154S	0082_MW154S_210621	Single_Level	3.8177	6	2-6_	14:38	2.77	1.048		HydroSleeve	22.7	1.42	25513	16594.5	7.04	-10.2			Cloudy
21/06/2021	MW155S	0082_MW155S_210621	Single_Level	5.0072	8.5	2.5-8.5_	14:51	3.725	1.282		HydroSleeve	28	1.1	29625		7.03	67.3			Cloudy
21/06/2021	MW310	0082_MW310_210621	Single_Level	5.401	6.29	6.5-6.5_	11:18	4.27	1.131		HydroSleeve	28.1	1.73	3120	2028	7.45	166.5			Cloudy,Brown
21/06/2021	MW311	0082_MW311_210621	Single_Level	4.205	5.5	2.5-5.5_	10:42	3.195	1.01		HydroSleeve	25.9	4.6	918	598	7.65	125.2			Clear
21/06/2021	MW315	0082_MW315_210621	Single_Level	8.018	9.5	6.5-9.5_	12:09	7.159	0.859		HydroSleeve	21.4	3.53	1512	981.5	8.13	58.6			Clear
21/06/2021	MW326	0082_MW326_210621	Single_Level	2.611	3.665	NA	15:11	1.845	0.766		HydroSleeve	25.2	0.95	40600	26390	7	-129		Organic	Cloudy,Black

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)	pH	Eh (mV)	Water Colour	Turbidity
SW161	21/06/2021	0082_SW161_210621	Direct into bottle	0.1	1	Slow		19.4	5.04	10885	8	80.2	Clear	Low
SW162	21/06/2021	0082_SW162_210621	Direct into bottle	0.1	0.6	Slow		19.8	5.38	10432	7.77	109.1	Clear	Low
SW163	21/06/2021	0082_SW163_210621	Direct into bottle	0.1	0.6	Slow	QC101/201	19.2	4.14	10904	7.86	99.5	Clear	Low
SW164	21/06/2021						Dry							
SW165	21/06/2021						Dry							
SW167	21/06/2021						Dry							
SW169	21/06/2021						Dry							
SW171	21/06/2021						Dry							
SW173	21/06/2021						Dry							
SW179	21/06/2021						Dry							
SW181	21/06/2021	0082_SW181_210621	Direct into bottle	0.1	0.3	Slow		22.1	2.44	55900	7.64	92.5	Clear	Low
OTH101	21/06/2021	0082_OTH101_210621	Direct into bottle	0.4				18.8	5.37	54570	7.61	91.8	Clear	
OTH102	21/06/2021	0082_OTH102_210621	Direct into bottle	0.3				19.4	5.36	53613	7.72	122.2	Cloudy	
OTH103	21/06/2021	0082_OTH103_210621	Direct into bottle	0.4				21.8	4.63	56048	7.95	105.1		
OTH104	21/06/2021	0082_OTH104_210621	Direct into bottle	0.4				22.2	4.28	28534	7.92	126.3	Clear	
OTH105	21/06/2021	0082_OTH105_210621	Direct into bottle	0.4				22.3	4.31	53880	7.91	121.9	Clear	
OTH106	21/06/2021	0082_OTH106_210621	Direct into bottle	0.4				22.1	3.77	56044	7.33	113.2	Clear	

Location ID	Date	Sample ID	Sample ID SS	Sampling Depth (m)	Sampling Method	Sample Condition	Sample Description	Other Comments
SD161	21/06/2021	0082_SD161_210621	0082_SD161_210621	0.1	Shovel/Trowel	Wet	Brown silty sand	
SD162	21/06/2021	0082_SD162_210621	0082_SD162_210621		Shovel/Trowel	Wet	Brown silty sand	
SD163	21/06/2021	0082_SD163_210621	0082_SD163_210621	0.1	Shovel/Trowel	Wet	Brown silty sand	QC102/202
SD164	21/06/2021	0082_SD164_210621	0082_SD164_210621	0.1	Shovel/Trowel	Dry	Red gravelly clay	QC105/205
SD181	21/06/2021	0082_SD181_210621	0082_SD181_210621	0.1	Shovel/Trowel	Wet	Black sand	Smelly
SS165	21/06/2021	0082_SS165_210621	0082_SS165_210621	0.1	Shovel/Trowel	Dry	Sandy clay red	
SS167	21/06/2021	0082_SS167_210621	0082_SS167_210621	0.1	Direct into Bottle	Dry	Sandy clay red	
SS169	21/06/2021	0082_SS169_210621	0082_SS169_210621	0.1	Direct into Bottle	Dry	Red clayey sand	
SS171	21/06/2021	0082_SS171_210621	0082_SS171_210621		Direct into Bottle	Dry	Red clayey sand	
SS179	21/06/2021	0082_SS179_210621	0082_SS179_210621	0.1	Shovel/Trowel	Dry	Brown sand	

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 21 June 2021 and 22 June 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (ref DEF19009_Harold E Holt Area B_SAQP_Rev5) 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-B). 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 11 days overdue **Sediment:** • pH – generally 3 days overdue • Conductivity – generally 3 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></td><td>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>5 for 43 primary water samples (11.6%)
2 for 11 primary sediment samples (18.2%)</td></tr>
<tr><td>Split duplicate</td><td>1 in 10 primary water samples (10%)
1 in 10 primary sediment samples (10%)</td><td>5 for 43 primary water samples (11.6%)
2 for 11 primary sediment samples (18.2%)</td></tr>
<tr><td>Rinsate</td><td>1 per day / equipment used</td><td>6 (3x equipment for 2 days) (100%)</td></tr>
<tr><td>Field Blank</td><td>1 per day / field team (esky)</td><td>6 (3x field teams for 2 days) (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: 43
▪ Duplicate samples analysed: 5
The level of RPD was acceptable for all field duplicates with exception of some exceedances for QC103/MW142. The RPD exceedances were generally minor and probably related to the low analyte concentrations of analyte pairs.
Sediment
▪ Number of primary samples analysed: 11
▪ Duplicate samples analysed: 2
The level of RPD 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>
▪ 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: 43
▪ Field Split Samples Analysed: 5
The level of RPD was acceptable for all field triplicates with exception of some exceedances for QC203/MW142. The RPD exceedances were 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: 11
▪ Field Split Samples Analysed: 2
All RPDs were of acceptable range.</td></tr>
</table>

QA/QC Aspects	Evidence & Evaluation
Field Blanks	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.
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: ▪ EP2107024, EP2107025, EP2107092, EP2107183 - Sulfate and chloride matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107086 - Sulfate, chloride, PFOS 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: ▪ EP2107086 - Lab duplicates for PFAS were undertaken less than the target rate. ▪ EP2107024, EP2107025, EP2107028, EP2107183 - 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.

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13 August 2015

APPENDIX

D

DATA ASSESSMENT

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Stantec

Table 1: HEH-B Groundwater Gauging Data

Date	Monitoring Location	Sample ID	Bore Description	Screen Interval (mTOC)	Bore Depth (mbTOC)	SWL (mbTOC)	TOC (mAHD)	RWL (mAHD)	Other Observations on Bore/Site
22/06/2021	MW022	0082_MW022_210622	Single Level	4.0-7.0	7.0	5.7	6.675	0.975	
16/11/2020	MW022		Single Level	4.0-7.0	7.0	-	6.675	-	Locked
21/06/2021	MW103D	0082_MW103D_210621	Single Level	11.0-15.0	15.0	8.445	9.3778	0.9328	
17/11/2020	MW103D	0082_MW103D_201117	Single Level	11.0-15.0	15.0	8.948	9.3778	0.4298	
21/06/2021	MW105S	0082_MW105S_210621	Single Level	2.0-4.0	4.0	2.92	3.8438	0.9238	
17/11/2020	MW105S		Single Level	2.0-4.0	4.0	-	3.8438	-	Dry
21/06/2021	MW109	0082_MW109_210621	Single Level	4.0-10.0	10.0	3.71	5.627	1.917	
17/11/2020	MW109	0082_MW109_201117	Single Level	4.0-10.0	10.0	5.307	5.627	0.32	
21/06/2021	MW113	0082_MW113_210621	Single Level	4.5-9.5	9.5	5.74	6.6842	0.9442	
17/11/2020	MW113	0082_MW113_201117	Single Level	4.5-9.5	9.5	6.243	6.6842	0.4412	
21/06/2021	MW115	0082_MW115_210621	Single Level	4.3-10.3	10.3	6.785	7.7258	0.9408	
17/11/2020	MW115	0082_MW115_201117	Single Level	4.3-10.3	10.3	7.258	7.7258	0.4678	
21/06/2021	MW118D	0082_MW118D_210621	Single Level	7.5-11.5	11.5	5.21	6.2622	1.0522	
16/11/2020	MW118D	0082_MW118D_201116	Single Level	7.5-11.5	11.5	5.124	6.2622	1.1382	
22/06/2021	MW122	0082_MW122_210622	Single Level	3.5-8.5	8.5	4.15	5.0782	0.9282	
16/11/2020	MW122	0082_MW122_201116	Single Level	3.5-8.5	8.5	4.781	5.0782	0.2972	
17/11/2020	MW126		Single Level	4.5-8.5	8.5	-	4.8325	-	No Access Asbestos removal
21/06/2021	MW126	0082_MW126_210621	Single Level	4.5-8.5	8.5	3.845	4.8325	0.9875	
21/06/2021	MW128	0082_MW128_210621	Multi level	3.7-4.2	4.2	2.13	2.5435	0.4135	
16/11/2020	MW128	0082_MW128_201116	Multi level	3.7-4.2	4.2	2.51	2.5435	0.0335	
21/06/2021	MW129	0082_MW129_3.5-4_210621	Multi level	3.5-4.0	4.0	1.855	2.5311	0.6761	
16/11/2020	MW129	0082_MW129_201116	Multi level	3.5-4.0	4.0	2.34	2.5311	0.1911	
21/06/2021	MW130	0082_MW130_6.9-7.4_210621	Multi level	6.9-7.4	7.4	1.695	2.4665	0.7715	4.7 screen pvc casing is broken
16/11/2020	MW130	0082_MW130_201116	Multi level	6.9-7.4	7.4	3.355	2.4364	-0.9186	
21/06/2021	MW131	0082_MW131_4-4.5_210621	Multi level	4.0-4.5	4.5	2.06	2.8774	0.8174	
16/11/2020	MW131	0082_MW131_201116	Multi level	4.0-4.5	4.5	2.69	2.8774	0.1874	
21/06/2021	MW132	0082_MW132_8.5-9_210621	Multi level	8.5-9.0	9.0	4.78	5.4383	0.6583	
16/11/2020	MW132	0082_MW132_201116	Multi level	8.5-9.0	9.0	5.22	5.4103	0.1903	
21/06/2021	MW133	0082_MW133_3-3.5_210621	Multi level	3.0-3.5	3.5	2.06	2.1505	0.0905	
16/11/2020	MW133	0082_MW133_201116	Multi level	3.0-3.5	3.5	2.05	2.1505	0.1005	
21/06/2021	MW134	0082_MW134_8.6-9.1_210621	Multi level	8.6-9.1	9.1	5.95	6.5308	0.5808	
17/11/2020	MW134	0082_MW134_201117	Multi level	8.6-9.1	9.1	6.345	6.5343	0.1893	
21/06/2021	MW135	0082_MW135_210621	Multi level	10.3-10.8	10.8	8.57	9.301	0.731	
17/11/2020	MW135	0082_MW135_201117	Multi level	10.3-10.8	10.8	8.99	9.2988	0.3088	
21/06/2021	MW137	0082_MW137_8.1-8.6_210621	Multi level	8.1-8.6	8.6	4.3	5.3907	1.0907	
16/11/2020	MW137	0082_MW137_6.0_201116	Multi level	8.1-8.6	8.6	5.209	5.3984	0.1894	
21/06/2021	MW142	0082_MW142_210621	Single Level	4.5-10.5	10.5	6.435	7.5281	1.0931	
17/11/2020	MW142	0082_MW142_201117	Single Level	4.5-10.5	10.5	7.04	7.5281	0.4881	
21/06/2021	MW143	0082_MW143_210621	Single Level	7.0-13.0	13	9.63	10.5204	0.8904	
17/11/2020	MW143	0082_MW143_201117	Single Level	7.0-13.0	13	10.07	10.5204	0.4504	
21/06/2021	MW144S	0082_MW144S_210621	Single Level	2.0-8.0	8.0	5.12	6.0715	0.9515	
17/11/2020	MW144S	0082_MW144S_201117	Single Level	2.0-8.0	8.0	5.82	6.0715	0.2515	
21/06/2021	MW145	0082_MW145_210621	Single Level	0.9-6.9	6.9	3.04	3.8644	0.8244	
17/11/2020	MW145	0082_MW145_201117	Single Level	0.9-6.9	6.9	3.244	3.8644	0.6204	
22/06/2021	MW147	0082_MW147_210622	Single Level	4.5-8.5	8.5	4.96	5.51	0.55	
17/11/2020	MW147	0082_MW147_201117	Single Level	4.5-8.5	8.5	5.238	5.51	0.272	
21/06/2021	MW148S	0082_MW148S_210621	Single Level	3.0-9.0	9.0	5.2	5.7648	0.5648	
17/11/2020	MW148S	0082_MW148S_201117	Single Level	3.0-9.0	9.0	5.585	5.7648	0.1798	
21/06/2021	MW151S	0082_MW151S_210621	Single Level	1.0-5.0	5.0	2.52	3.40	0.88	
16/11/2020	MW151S	0082_MW151S_201116	Single Level	1.0-5.0	5.0	3.27	3.40	0.13	
22/06/2021	MW152S	0082_MW152S_210622	Single Level	2.5-6.5	6.5	2.53	3.4103	0.8803	
16/11/2020	MW152S	0082_MW152S_201116	Single Level	2.5-6.5	6.5	3.253	3.4103	0.1573	
22/06/2021	MW153S	0082_MW153S_210622	Single Level	2.0-6.0	6.0	3.885	4.7872	0.9022	
16/11/2020	MW153S	0082_MW153S_201116	Single Level	2.0-6.0	6.0	4.617	4.7872	0.1702	
21/06/2021	MW154S	0082_MW154S_210621	Single Level	2.0-6.0	6.0	2.77	3.8177	1.0477	
16/11/2020	MW154S	0082_MW154S_201116	Single Level	2.0-6.0	6.0	3.61	3.8177	0.2077	
21/06/2021	MW155S	0082_MW155S_210621	Single Level	2.5-8.5	8.5	3.725	5.0072	1.2822	
16/11/2020	MW155S	0082_MW155S_201116	Single Level	2.5-8.5	8.5	4.813	5.0072	0.1942	
21/06/2021	MW310	0082_MW310_210621	Single Level	6.5-6.5	6.5	4.27	5.401	1.131	
17/11/2020	MW310	0082_MW310_201117	Single Level	6.5-6.5	6.5	5.04	5.401	0.361	
21/06/2021	MW311	0082_MW311_210621	Single Level	2.5-5.5	5.5	3.195	4.205	1.01	
17/11/2020	MW311	0082_MW311_201117	Single Level	2.5-5.5	5.5	3.84	4.205	0.365	
21/06/2021	MW315	0082_MW315_210621	Single Level	6.5-9.5	9.5	7.159	8.018	0.859	
17/11/2020	MW315	0082_MW315_201117	Single Level	6.5-9.5	9.5	7.59	8.018	0.428	
21/06/2021	MW326	0082_MW326_210621	Single Level	NA	5.3	1.845	2.611	0.766	
17/11/2020	MW326	0082_MW326_201117	Single Level	NA	5.3	2.437	2.611	0.174	
NA - not available, no bore log available.									

Table 2: HEH-B Water Field Parameters

Date	Location ID	Sample ID	Other Observations on Bore/Site	Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS	pH	Eh (mV)	Odour?	Sample Colour
16/11/2020	MW022	-	Bore Locked	-	-	-	-	-	-	-	-	-
17/11/2020	MW103D	0082_MW103D_201117	-	HydraSleeve	30.3	1.44	6656	3932.5	7.01	-82.6	no	Brown,Cloudy
17/11/2020	MW105S	-	Dry	HydraSleeve	-	-	-	-	-	-	-	-
17/11/2020	MW109	0082_MW109_201117	-	HydraSleeve	28.9	1.11	12191	7384	7.25	-34.5	no	Cloudy,Brown
17/11/2020	MW113	0082_MW113_201117	-	HydraSleeve	26.9	2.9	3795	2405	7.41	-7.6	no	Cloudy,Brown
17/11/2020	MW115	0082_MW115_201117	-	HydraSleeve	29.2	0.59	5906	3562	7.01	-89.7	no	Cloudy,Black
16/11/2020	MW118D	0082_MW118D_201116	-	HydraSleeve	30.2	2.48	4778	3308.5	7.58	-111	no	Cloudy,Brown
16/11/2020	MW122	0082_MW122_201116	-	HydraSleeve	29.5	1.33	9602	5746	7.33	-148.5	no	Brown,Cloudy
17/11/2020	MW126	-	Access restricted for Asbestos removal works	-	-	-	-	-	-	-	-	-
16/11/2020	MW128	0082_MW128_201116	-	HydraSleeve	30.4	1.99	66778	39325	7.25	72.4	Dirt odour	Brown,Cloudy
16/11/2020	MW129	0082_MW129_201116	-	HydraSleeve	31.9	1.77	55082	35803.3	5.97	164	-	-
16/11/2020	MW130	0082_MW130_201116	-	HydraSleeve	30.5	1.71	52796	34317.4	6.95	174.1	-	-
16/11/2020	MW131	0082_MW131_201116	-	HydraSleeve	31	1.88	47306	30748.9	7.12	22.2	-	-
16/11/2020	MW132	0082_MW132_201116	-	HydraSleeve	28.7	2.1	55228	33605	4.2	237.2	no	Clear,Cloudy
16/11/2020	MW133	0082_MW133_201116	-	HydraSleeve	30.2	1.54	53972	35081.8	7.36	199.7	-	-
17/11/2020	MW134	0082_MW134_201117	-	HydraSleeve	29.6	2.63	49581	29607.5	6.95	27.6	no	Brown,Cloudy
17/11/2020	MW135	0082_MW135_201117	-	HydraSleeve	30.6	1.05	28725	16874	7.77	-86.2	Dirt odour	Brown,Cloudy
16/11/2020	MW137	0082_MW137_6.0_201116	-	HydraSleeve	31	1.35	23570	13747.5	7.04	-204.1	no	Brown,Black,Cloudy
17/11/2020	MW142	0082_MW142_201117	-	HydraSleeve	29.5	0.88	3115	2024.75	7.14	211.6	-	-
17/11/2020	MW143	0082_MW143_201117	-	HydraSleeve	31	1.34	1562	1015.3	8.28	175.7	-	-
17/11/2020	MW144S	0082_MW144S_201117	-	HydraSleeve	28.4	0.46	5262	3420.3	7.74	169.8	no	Cloudy
17/11/2020	MW145	0082_MW145_201117	-	HydraSleeve	28.1	1.96	54683	33605	6.82	74.4	no	Cloudy,Brown
17/11/2020	MW147	0082_MW147_201117	-	HydraSleeve	28.6	1.59	40108	24381.5	5.73	5	Slight hydrocarbon odour	Clear,Green
17/11/2020	MW148S	0082_MW148S_201117	-	HydraSleeve	30.2	1.98	50867	30095	7.8	14.7	no	Cloudy,Brown
16/11/2020	MW151S	0082_MW151S_201116	-	HydraSleeve	30	0.36	55266	35922.9	7.14	76.7	-	-
16/11/2020	MW152S	0082_MW152S_201116	-	HydraSleeve	29.2	1.66	55686	33540	7.09	-33.3	no	Brown,Cloudy
16/11/2020	MW153S	0082_MW153S_201116	-	HydraSleeve	28.9	1.44	50566	30485	6.61	1.1	no	Brown,Cloudy
16/11/2020	MW154S	0082_MW154S_201116	-	HydraSleeve	30.7	1.98	25439	14904.5	6.72	46.1	no	Cloudy,Brown
16/11/2020	MW155S	0082_MW155S_201116	-	HydraSleeve	30.3	1.07	28076	16601	6.56	-11	no	Cloudy,Brown
17/11/2020	MW310	0082_MW310_201117	-	HydraSleeve	31.3	2.23	3172	2061.8	7.64	178.8	-	-
17/11/2020	MW311	0082_MW311_201117	-	HydraSleeve	30.4	2.49	1360	884	7.77	183.4	-	-
17/11/2020	MW315	0082_MW315_201117	-	HydraSleeve	30.4	6.73	2843	1670.5	9	24.7	no	Clear,Brown
17/11/2020	MW326	0082_MW326_201117	-	HydraSleeve	29.3	0.49	44266	26630	6.82	-107.2	no	Cloudy,Brown
16/11/2020	OTH101	0082_OTH101_201116	-	Direct into bottle	28.2	3.97	65166	39910.18	5.4	214.2	no	Clear
16/11/2020	OTH102	0082_OTH102_201116	-	Direct into bottle	29.1	4.08	65705	39650	5.12	224.8	no	Clear,Cloudy
16/11/2020	OTH103	0082_OTH103_201116	-	Direct into bottle	27.3	4.08	62149	38675	6.48	164.8	no	Clear
16/11/2020	OTH104	0082_OTH104_201116	-	Direct into bottle	26	4.15	63120	40170	4.42	246.3	no	Clear,Cloudy
16/11/2020	OTH105	0082_OTH105_201116	-	Direct into bottle	26.4	3.91	62714	39650	8.91	-7.6	no	Clear
16/11/2020	OTH106	0082_OTH106_201116	-	Direct into bottle	26.3	3.99	62445	39585	7.44	81.3	no	Clear
16/11/2020	SW164	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW165	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW181	0082_SW181_201116	-	Direct into Bottle	30.6	1.94	145060	94289	8.51	121	-	brown, medium turbidity
16/11/2020	SW167	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW169	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW171	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW173	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW179	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW161	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW162	-	Dry	-	-	-	-	-	-	-	-	-
16/11/2020	SW163	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW167	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW169	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW171	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW173	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW179	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW164	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW165	-	Dry	-	-	-	-	-	-	-	-	-
3/03/2021	SW181	0082_SW181_210303	-	Direct into bottle	31.7	4.21	70491	45819.15	8.26	103.6	-	Yellow, low to med turbidity
3/03/2021	SW161	0082_SW161_210303	-	Direct into bottle	34.9	3.23	42812	27827.8	7.89	79.2	-	Colourless
3/03/2021	SW163	0082_SW163_210303	-	Direct into bottle	35.1	1.13	56275	36578.75	7.56	72.3	-	Colourless
3/03/2021	SW162	0082_SW162_210303	-	Direct into bottle	34.5	2.69	55574	36123.1	7.71	79	-	Colourless
22/06/2021	MW022	0082_MW022_210622	-	HydraSleeve	28.1	1.99	899	585	7.97	96	-	Brown,Cloudy
21/06/2021	MW103D	0082_MW103D_210621	-	HydraSleeve	27	1.55	5535	3594.5	7.22	88.6	-	Clear
21/06/2021	MW105S	0082_MW105S_210621	-	HydraSleeve	25.1	1.64	5248	3412.5	7.57	-35	Organic	Cloudy,Black
21/06/2021	MW109	0082_MW109_210621	-	HydraSleeve	23.5	4.69	473.45	306.8	7.87	100.6	-	Brown
21/06/2021	MW113	0082_MW113_210621	-	HydraSleeve	27.1	0.75	3591	2333.5	7.7	40.8	-	Clear,Brown
21/06/2021	MW115	0082_MW115_210621	-	HydraSleeve	27.4	0.88	5254	3412.5	7.27	-181.1	Organic	Clear,Black
21/06/2021	MW118D	0082_MW118D_210621	-	HydraSleeve	21.9	3.04	9790	6370	7.91	91.8	-	Clear
22/06/2021	MW122	0082_MW122_210622	-	HydraSleeve	25.6	1.34	9340	6071	7.67	113.4	-	Cloudy
21/06/2021	MW126	0082_MW126_210621	-	HydraSleeve	22.9	8.48	2394	1553.5	7.65	95	-	Clear
21/06/2021	MW128	0082_MW128_210621	Not field filtered	HydraSleeve	26.3	2.05	52736	34278.4	7.35	68.7	-	Brown
21/06/2021	MW129	0082_MW129_3.5-4_210621	Not enough water for DOC	HydraSleeve	24.9	3.82	56175	36513.75	7.69	-	-	Clear
21/06/2021	MW130	0082_MW130_6.9-7.4_210621		HydraSleeve	26.2	1.77	27552	17908.8	7.51	106.7	-	Clear
21/06/2021	MW131	0082_MW131_4-4.5_210621	-	HydraSleeve	25	4.61	2406	1563.9	8.82	73	-	Cloudy
21/06/2021	MW132	0082_MW132_8.5-9_210621	Not enough water for DOC	HydraSleeve	25.3	3.04	52310	34001.5	7.68	117.5	-	Cloudy
21/06/2021	MW133	0082_MW133_3-3.5_210621	-	HydraSleeve	25.4	2.65	11951	7768.15	7.85	37.7	-	Cloudy
21/06/2021	MW134	0082_MW134_8.6-9.1_210621	-	HydraSleeve	23.9	2.42	41780	27196	7.04	43.5	-	Cloudy
21/06/2021	MW135	0082_MW135_210621	-	HydraSleeve	27.3	1.2	25098	6302	7.33	33.6	-	Cloudy,Brown
21/06/2021	MW137	0082_MW137_8.1-8.6_210621	-	HydraSleeve	27.9	1.34	21137	13739.05	7.23	-6.7	-	Cloudy
21/06/2021	MW142	0082_MW142_210621	-	HydraSleeve	25.9	1.2	5796	3770	7	143.8	-	Clear,Brown
21/06/2021	MW143	0082_MW143_210621	-	HydraSleeve	26.2	2.1	1611	1046.5	8.12	0.3	-	Clear
21/06/2021	MW144S	0082_MW144S_210621	-	HydraSleeve	22.7	3.73	1569	1020.5	7.95	94.3	-	Clear
21/06/2021	MW145	0082_MW145_210621	-	HydraSleeve	25.1	2.79	53180	34580	7.12	105.8	-	Cloudy,Brown
22/06/2021	MW147	0082_MW147_210622	-	HydraSleeve	21.4	1.38	36568	23777	7.04	-52.5	Mild hydrocarbon	Cloudy,Green
21/06/2021	MW148S	0082_MW148S_210621	-	HydraSleeve	24	1.97	35.983	23393.5	7.01	-43.5	-	Clear
21/06/2021	MW151S	0082_MW151S_210621	-	HydraSleeve	28.3	2.11	28714	18664.1	7.27	91.8	-	Clear
22/06/2021	MW152S	0082_MW152S_210622	-	HydraSleeve	27.3	1.03	51252	33410	7.39	140	-	Cloudy
22/06/2021	MW153S	0082_MW153S_210622	-	HydraSleeve	20.3	2.77	49053	31882.5	7.22	81.4	-	Cloudy
21/06/2021	MW154S	0082_MW154S_210621	-	HydraSleeve	22.7	1.42	25513	16594.5	7.04	-10.2	-	Cloudy

Table 2: HEH-B Water Field Parameters

Date	Location ID	Sample ID	Other Observations on Bore/Site	Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS	pH	Eh (mV)	Odour?	Sample Colour
21/06/2021	MW155S	0082_MW155S_210621	-	HydraSleeve	28	1.1	29625	19256.25	7.03	67.3	-	Cloudy
21/06/2021	MW310	0082_MW310_210621	-	HydraSleeve	28.1	1.73	3120	2028	7.45	166.5	-	Cloudy,Brown
21/06/2021	MW311	0082_MW311_210621	-	HydraSleeve	25.9	4.6	918	598	7.65	125.2	-	Clear
21/06/2021	MW315	0082_MW315_210621	-	HydraSleeve	21.4	3.53	1512	981.5	8.13	58.6	-	Clear
21/06/2021	MW326	0082_MW326_210621	-	HydraSleeve	25.2	0.95	40600	26390	7	-129	Organic	Cloudy,Black
21/06/2021	SW161	0082_SW161_210621	-	Direct into bottle	19.4	5.04	10885	7075.25	8	80.2	-	Clear
21/06/2021	SW162	0082_SW162_210621	-	Direct into bottle	19.8	5.38	10432	6780.8	7.77	109.1	-	Clear
21/06/2021	SW163	0082_SW163_210621	-	Direct into bottle	19.2	4.14	10904	7087.6	7.86	99.5	-	Clear
21/06/2021	SW164	-	Dry	-	-	-	-	-	-	-	-	-
21/06/2021	SW165	-	Dry	-	-	-	-	-	-	-	-	-
21/06/2021	SW167	-	Dry	-	-	-	-	-	-	-	-	-
21/06/2021	SW169	-	Dry	-	-	-	-	-	-	-	-	-
21/06/2021	SW171	-	Dry	-	-	-	-	-	-	-	-	-
21/06/2021	SW173	-	Dry	-	-	-	-	-	-	-	-	-
21/06/2021	SW179	-	Dry	-	-	-	-	-	-	-	-	-
21/06/2021	SW181	0082_SW181_210621	-	Direct into bottle	22.1	2.44	55900	36335	7.64	92.5	-	Clear
21/06/2021	OTH101	0082_OTH101_210621	-	Direct into bottle	18.8	5.37	54570	35470.5	7.61	91.8	-	Clear
21/06/2021	OTH102	0082_OTH102_210621	-	Direct into bottle	19.4	5.36	53613	34848.45	7.72	122.2	-	Cloudy
21/06/2021	OTH103	0082_OTH103_210621	-	Direct into bottle	21.8	4.63	56048	36431.2	7.95	105.1	-	-
21/06/2021	OTH104	0082_OTH104_210621	-	Direct into bottle	22.2	4.28	28534	18547.1	7.92	126.3	-	Clear
21/06/2021	OTH105	0082_OTH105_210621	-	Direct into bottle	22.3	4.31	53880	35022	7.91	121.9	-	Clear
21/06/2021	OTH106	0082_OTH106_210621	-	Direct into bottle	22.1	3.77	56044	36428.6	7.33	113.2	-	Clear

Location ID	Date	Sample ID	Sampling Method	Sample Depth (m)	Comments	Sample Description
SS167	16/11/2020	0082_SS167_201116	Shovel, Trowel	0.1		
SS169	16/11/2020	0082_SS169_201116	Shovel, Trowel	0.1		
SD164	16/11/2020	0082_SD164_201116	Shovel, Trowel	0.1		
SS165	16/11/2020	0082_SS165_201116	Shovel, Trowel	0.1		
SD181	16/11/2020	0082_SD181_201116	Shovel, Trowel	0.1		
SD161	16/11/2020	0082_SD161_201116	Shovel, Trowel	0.1	Creek bed dry	
SD162	16/11/2020	0082_SD162_201116	Shovel, Trowel	0.1	Creek bed dry	
SS179	16/11/2020	0082_SS179_201116	Shovel, Trowel	0.1		
SS173	16/11/2020	0082_SS173_201116	Shovel, Trowel	0.1		
SS171	16/11/2020	0082_SS171_201116	Shovel, Trowel	0.1		
SD163	16/11/2020	0082_SD163_201116	Shovel, Trowel	0.1		
SD164	3/03/2021	0082_SD164_210303	Shovel, Trowel	0.1	Dry	Brown/red, soil, dry, fine to med
SS167	3/03/2021	0082_SS167_210303	Shovel, Trowel	0.1	Wet	Red, none, slightly noist, fine/med grained
SS169	3/03/2021	0082_SS169_210303	Shovel, Trowel	0.1	Dry	Yellow/red, none, fine/med sand
SS171	3/03/2021	0082_SS171_210303	Shovel, Trowel	0.1	Dry	Red, none, dry fine sand
SS173	3/03/2021	0082_SS173_210303	Shovel, Trowel	0.1	Dry	Red, none, fine slightly moist sand
SD161	3/03/2021	0082_SD161_210303	Shovel, Trowel	0.1	Wet	Brown, stagnant, wet clay
SD162	3/03/2021	0082_SD162_210303	Shovel, Trowel	0.1	Wet	Brown/grey, stagnant, wet clay
SS165	3/03/2021	0082_SS165_210303	Shovel, Trowel	0.1	Dry	Orange, no odour, moist
SD181	3/03/2021	0082_SD181_210303	Shovel, Trowel	0.1	Wet	Slight organic odour, brown silty sand
SD163	3/03/2021	0082_SD163_210303	Shovel, Trowel	0.1	Wet	Grey, organic, wet clay
SS179	4/03/2021	0082_SS179_210304	Shovel, Trowel	0.1	Dry	Clay
SD161	21/06/2021	0082_SD161_210621	Shovel, Trowel	0.1	Wet	Brown silty sand
SD162	21/06/2021	0082_SD162_210621	Shovel, Trowel	0.1	Wet	Brown silty sand
SD163	21/06/2021	0082_SD163_210621	Shovel, Trowel	0.1	Wet	Brown silty sand
SD164	21/06/2021	0082_SD164_210621	Shovel, Trowel	0.1	Dry	Red gravelly clay
SD181	21/06/2021	0082_SD181_210621	Shovel, Trowel	0.1	Wet	Black sand
SS165	21/06/2021	0082_SS165_210621	Shovel, Trowel	0.1	Dry	Sandy clay red
SS167	21/06/2021	0082_SS167_210621	Shovel, Trowel	0.1	Dry	Sandy clay red
SS169	21/06/2021	0082_SS169_210621	Shovel, Trowel	0.1	Dry	Red clayey sand
SS171	21/06/2021	0082_SS171_210621	Shovel, Trowel	0.1	Dry	Red clayey sand
SS179	21/06/2021	0082_SS179_210621	Shovel, Trowel	0.1	Dry	Brown sand

Table 4 - Water Analytical Results

					PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides							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)	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)
					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	µg/L	µg/L	µg/L	mg/L	mg/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	0.01	0.001	0.001	1	1
PFAS NEMP 2020 Interim Marine 99%									*0.00023*						*19*																						
PFAS NEMP 2020 Recreational Water															**10**																			**2**			
Site ID	**Field ID**	**Location Code**	**Date**	**Lab Report Number**																																	
0082	0082_MW22_180221	MW022	21/02/2018	207287	0.2	0.21	1.7	0.16	*3.2*	<0.002	0.3	0.94	0.79	0.59	0.33	<0.002	<0.005	0.12	<0.05	<0.01	<0.002	0.002	0.95	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05					340
0082	0082_MW22_180609	MW022	9/06/2018	212095	0.12	0.15	1.4	0.13	*1.6*	<0.002	0.33	0.81	0.86	0.61	0.32	0.002	<0.005	0.18	<0.05	<0.01	<0.002	<0.001	0.26	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		**3**			370
0082	0082_MW22_191127	MW022	27/11/2019	EP1912548	0.10	0.11	1.39	0.06	*2.33*	<0.02	0.3	1	0.72	0.64	0.37	<0.02	<0.02	0.22	<0.05	<0.02	<0.02	<0.05	0.4	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	7.25	**3.72**	7.64	<1	364
0082	0082_MW022_200623	MW022	23/06/2020	EP2006549	0.16	0.25	2.39	0.1	*4.1*	<0.02	0.5	1.49	1.21	1.31	0.81	<0.02	<0.02	0.36	<0.05	<0.02	<0.02	<0.05	0.46	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	12.4	**6.49**	13.1	<1	402
0082	0082_MW022_210622	MW022	22/06/2021	EP2107092	0.09	0.12	1.31	0.07	*3.19*	<0.02	0.3	0.95	0.88	0.81	0.56	<0.02	<0.02	0.36	<0.05	<0.02	<0.02	<0.05	0.18	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	8.27	**4.5**	8.82	<1	381
0082	0082_MW103D_180309	MW103D	9/03/2018	208025	0.22	0.26	3.3	0.28	*13*	0.003	0.14	0.68	0.28	0.16	0.14	<0.002	<0.005	0.047	<0.05	<0.01	<0.002	<0.001	0.1	0.008	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		**16**			180
0082	0082_MW103D_180609	MW103D	9/06/2018	212095	0.19	0.21	2.5	0.22	*7.5*	<0.002	0.12	0.53	0.25	0.14	0.13	<0.002	<0.005	0.036	<0.05	<0.01	<0.002	<0.001	0.063	0.003	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		**10**			230
0082	0082_MW103D_191127	MW103D	27/11/2019	EP1912547	0.26	0.29	2.92	0.22	*8*	<0.02	0.1	0.62	0.25	0.09	0.1	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.07	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	12.4	**10.9**	12.9	<1	173
0082	0082_MW103D_200623	MW103D	23/06/2020	EP2006519	0.31	0.46	2.72	0.16	*3.57*	<0.02	0.1	0.76	0.23	0.09	0.09	<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	7.93	**6.29**	8.55	<1	233
0082	0082_MW103D_201117	MW103D	17/11/2020	EP2012738	0.20	0.22	2.05	0.11	*4.03*	<0.02	<0.1	0.5	0.19	0.07	0.08	<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	7.18	**6.08**	7.51	<1	227
0082	0082_MW103D_210621	MW103D	21/06/2021	EP2107028	0.27	0.37	2.82	0.13	*2.64*	<0.02	<0.1	0.74	0.21	0.07	0.08	<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	6.83	**5.46**	7.33	<1	245
0082	0082_MW105S_180309	MW105S	9/03/2018	208025	0.055	0.091	0.97	0.11	*6*	<0.002	0.12	0.38	0.24	0.27	0.18	<0.002	<0.005	0.19	<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		**7**			460
0082	0082_MW105S_180604	MW105S	4/06/2018	211639	0.057	0.064	0.59	0.031	*4.6*	<0.002	0.11	0.34	0.26	0.22	0.14	<0.002	<0.005	0.14	<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		**5.2**			460
0082	0082_MW105S_191127	MW105S	27/11/2019	EP1912547	0.11	0.15	1.1	0.03	*3.92*	<0.02	0.1	0.54	0.21	0.16	0.13	<0.02	<0.02	0.14	<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	6.27	**5.02**	6.59	<1	426
0082	0082_MW105S_210621	MW105S	21/06/2021	EP2107028	0.14	0.20	1.66	0.06	*6.18*	<0.02	0.2	0.78	0.5	0.48	0.33	<0.02	<0.02	0.13	<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	10.3	**7.84**	10.7	<1	813
0082	0082_MW109_180308	MW109	8/03/2018	208025	0.74	0.73	9.1	0.26	*1.8*	<0.002	0.077	1.4	0.15	0.077	0.17	<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		**11**			520
0082	0082_MW109_180618	MW109	18/06/2018	212373	0.57	0.66	8.6	0.14	*1.1*	<0.002	0.072	1.2	0.15	0.051	0.15	<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		**9.7**			560
0082	0082_MW109_191127	MW109	27/11/2019	EP1912549	0.64	0.85	8.6	0.22	*1.41*	<0.02	<0.1	1.4	0.18	0.05	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	12.4	**10**	13.5	<1	577
0082	0082_MW109_200623	MW109	23/06/2020	EP2006519	0.78	0.80	7.82	0.16	*1.87*	<0.02	<0.1	1.56	0.18	0.07	0.2	<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	12.5	**9.69**	13.4	<1	594
0082	0082_MW109_201117	MW109	17/11/2020	EP2012738	0.64	0.90	8.1	0.25	*2.22*	<0.02	<0.1	1.21	0.19	0.07	0.18	<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	12.6	**10.3**	13.8	<1	605
0082	0082_MW109_210621	MW109	21/06/2021	EP2107033	<0.02	<0.02	0.08	<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	0.08	0.08	0.08	<1	491
0082	0082_MW113_180310	MW113	10/03/2018	208025	0.026	0.031	0.22	0.011	*0.052*	<0.002	0.01	0.035	0.02	0.014	0.007	<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		0.3			420
0082	0082_MW113_180609	MW113	9/06/2018	212095	0.026	0.028	0.22	0.011	*0.054*	<0.002	0.01	0.04	0.021	0.011	0.006	<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		0.27			620
0082	0082_MW113_191127	MW113	27/11/2019	EP1912547	0.03	0.03	0.32	<0.02	*0.39*	<0.02	<0.1	0.04	0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.07	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.88	0.71	0.91	<1	534
0082	0082_MW113_200623	MW113	23/06/2020	EP2006519	0.03	0.03	0.24	<0.02	*0.05*	<0.02	<0.1	0.04	<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	0.36	0.29	0.39	<1	564
0082	0082_MW113_201117	MW113	17/11/2020	EP2012738	0.03	0.02	0.22	<0.02	*0.06*	<0.02	<0.1	0.03	<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	0.34	0.28	0.36	<1	522
0082	0082_MW113_210621	MW113	21/06/2021	EP2107028	0.02	0.02	0.23	<0.02	*0.06*	<0.02	<0.1	0.03	<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	0.34	0.29	0.36	<1	543
0082	0082_MW115_180308	MW115	8/03/2018	208025	0.008	0.013	0.082	0.006	*0.27*	<0.002	0.006	0.01	0.006	0.013	0.12	<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		0.4			220
0082	0082_MW115_180609	MW115	9/06/2018	212095	0.009	0.020	0.12	0.008	*0.046*	<0.002	0.02	0.037	0.04	0.022	0.13	<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		0.17			280
0082	0082_MW115_191127	MW115	27/11/2019	EP1912547	0.15	0.20	3.14	0.16	*9.12*	<0.02	0.8	2.36	2.07	0.72	0.4	<0.02	<0.02	0.02	<0.05	<0.02	<0.02	<0.05	3.8	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	22.6	**12.3**	22.9	<1	300
0082	0082_MW115_200623	MW115	23/06/2020	EP2006519	0.26	0.36	4.04	0.22	*10.4*	<0.02	0.9	2.92	2.83	1.29	0.68	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	5.53	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	28.8	**14.4**	29.5	<1	308
0082	0082_MW115_201117	MW115	17/11/2020	EP2012738	0.17	0.25	3.68	0.2	*12.2*	<0.02	1	2.11	2.61	0.93	0.55	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	6.08	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	29.3	**15.9**	29.8	<1	304
0082	0082_MW115_210621	MW115	21/06/2021	EP2107028	0.17	0.26	3.42	0.21	*12.2*	<0.02	0.8	2.36	2.36	0.91	0.53	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	4.51	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	27.3	**15.6**	27.8	<1	294
0082	0082_MW118D_180305	MW118D	5/03/2018	207818	1.2	1.4	13	0.98	*18*	<0.002	0.85	3.7	2.1	1.2	1.8	<0.002	<0.005	0.11	<0.05	<0.01	<0.002	0.1	30	0.12	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		**31**			600
0082	0082_MW118D_180609	MW118D	9/06/2018	212095	0.82	0.73	7	1	*11*	<0.02	0.57	2.5	1.8	0.9	1.5	<0.02	<0.05	0.17	<0.5	<0.1	<0.02	0.08	18	0.069	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		**18**			560
0082	0082_MW118D_191127	MW118D	27/11/2019	EP1912548	0.90	1.03	7	0.76	*16.4*	<0.02	0.6	3.3	1.46	0.7	1.23	<0.02	<0.02	0.11	<0.05	<0.02	<0.02	0.08	19.2	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	50.8	**23.4**	52.8	<1	590
0082	0082_MW118D_200623	MW118D	23/06/2020	EP2006549	0.82	0.88	7.1	0.6	*11.6*	<0.02	0.6	2.5	1.34	0.71	1.28	<0.02	<0.02	0.1	<0.05	<0.02	<0.02	0.1	14.8	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	40.8	**18.7**	42.4	<1	674
0082	0082_MW118D_201116	MW118D	16/11/2020	EP2012669	0.83	0.78	6.19	0.66	*14.3*	<0.02	0.3	1.93	0.93	0.54	1.1	<0.02	<0.02	0.09	<0.05	<0.02	<0.02	<0.05	15.6	0.06	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	41.8	**20.5**	43.3	<1	657
0082	0082_MW118D_210621	MW118D	21/06/2021	EP2107033	0.70	0.70	5.53	0.64	*12.9*	<0.02	0.4	2.03	1.29	0.61	1.24	<0.02	<0.02	0.1	<0.05	<0.02	<0.02	0.06	12.5	0.08	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	37.3	**18.4**	38.8	<1	672
0082	0082_MW122_180305	MW122	5/03/2018	207818	0.21	0.24	2.1	0.04	*0.16*	0.003	0.2	0.69	0.47	0.22	0.12	0.003	<0.005	0.001	<0.05	<0.01	0.005	0.003	0.072	0.003	0.001	0.02	<0.005	0.006	0.02	<0.01	0.006	<0.05		**2.3**			580
0082	0082_MW122_180616	MW122	16/06/2018	212373	0.24	0.24	2.5	0.094	*0.19*	<0.002	0.26	0.89	0.54	0.26	0.19	<0.002	<0.005	0.002	<0.05	<0.01	<0.002	0.003	0.07	<0.001	<0.001	<0.01	<0.01	<0.002	<0.01	<0.01	<0.002	<0.05		**2.7**			700
0082	0082_MW122_191127	MW122	27/11/2019	EP1912549	0.28	0.31	2.6	0.05	*0.15*	<0.02	0.3	1.02	0.77	0.27	0.18	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.1	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	5.67	**2.75**	6.03	<1	773
0082	0082_MW122_200623	MW122	23/06/2020	EP2006549	0.34	0.45	3.15	0.07	*0.26*	<0.02	0.3	1.25	0.87	0.42	0.29	<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	7.01	**3.41**	7.53	<1	820
0082	0082_MW122_201116	MW122	16/11/2020	EP2012669	0.15	0.18	1.53	0.05	*0.25*	<0.02	0.1	0.55	0.33	0.21	0.16	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.1	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	3.38	1.78	3.61	<1	700
0082	0082_MW122_210622	MW122	22/06/2021	EP2107092	0.15	0.15	1.34	0.04	*0.32*	<0.02	0.1	0.44	0.34	0.17	0.12	<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	2.98	1.66	3.17	<1	687
0082	0082_MW126_180305	MW126	5/03/2018	207818	0.011	0.011	0.11	0.006	*0.26*	<0.002	0.12	0.29	0.28	0.13	0.06	0.003	<0.005	0.033	<0.05	<0.01	<0.002	<0.001	0.05	0.002	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.4			160
0082	0082_MW126_180616	MW126	16/06/2018	212373	0.006	0.004	0.059	0.004	*0.25*	<0.002	0.06	0.14	0.16	0.1	0.05	<0.002	<0.005	0.034	<0.05	<0.01	<0.002	<0.001	0.033	0.004	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.31			160
0082	0082_MW126_191127	MW126	27/11/2019	EP1912546	0.08	0.09	0.69	0.04	*1.06*	<0.02	<0.1	0.34	0.32	0.19	0.11	<0.02	<0.02	0.04	<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	2.79	1.75	2.96	<1	405
0082	0082_MW126_200623	MW126	23/06/2020	EP2006549	0.08	0.11	0.62	0.03	*1.04*	<0.02	<0.1	0.35	0.29	0.21	0.13	<0.02	<0.02	0.04	<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	2.72	1.66	2.90	<1	385
0082	0082_MW126_210621	MW126	21/06/2021	EP2107033	0.06	0.07	0.65	0.04	*2.25*	<0.02	0.2	0.5	0.5	0.24	0.16	<0.02	<0.02	0.06	<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	4.56	**2.9**	4.73	<1	409
0082	0082_MW128_4.2_180305	MW128	5/03/2018	207818	<0.001	<0.001	<0.001	<0.001	*0.001*	<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	0.094	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001			210
0082	0082_MW128_6.2_180305	MW128	5/03/2018	207818	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	0.02	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.02	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001			220
0082	0082_MW128_8.2_180305	MW128	5/03/2018	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	0.04	<0.01	<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		<0.001			190
0082	0082_MW128_3.7-4.2_180615	MW128	15/06/2018	212373	<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	<0.01	<0.002	<0.01	<0.01	<0.002	<0.05		<0.001			240
0082	0082_MW128_5.7-6.2_180615	MW128	15/06/2018	212373	<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	<0.002	<0.001	0.001	<0.001	<0.001	<0.01	<0.01	<0.002	<0.01	<0.01	<0.002	<0.05		<0.001			200
0082	0082_MW128_7.7-8.2_180615	MW128	15/06/2018	212373	<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	<0.01	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001			180
0082	0082_MW128_3.7-4.2_191127	MW128	27/11/2019	EP1912546	<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	<0.01	<0.01	<0.01	<1	105
0082	0082_MW128_200623	MW128	23/06/2020	EP2006518	<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	<0.01	<0.01	<0.01	<1	183
0082	0082_MW128_201116	MW128	16/11/2020	EP2012670	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.12	<0.12	<0.05	<0.12	<0.05	<0.05	<0.05	<1	185
0082	0082_MW128_3.7-4.2_210621	MW128	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	220
0082	0082_MW129_3.5-4.0_180305	MW129	5/03/2018	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	0.004	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.005	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001			170
0082	0082_MW129_5.5-6.0_180305	MW129	5/03/2018	207818	<0.001	<0.001	<0.001	<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	0.012	<0.001	<0.001	<0.01	<0.005	0.002	<0.005	<0.01	0.003	<0.05		<0.001			150
0082	0082_MW129_7.5-8.0_180305	MW129	5/03/2018	207818	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.014	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001			130
0082	0082_MW129_3.5-4.0_180621	MW129	21/06/2018	212780	<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		<0.001	<0.001		170
0082	0082_MW129_5.5-6.0_180621	MW129	21/06/2018	212780	<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		<0.001	<0.001		160
0082	0082_MW129_7.5-8.0_180621	MW129	21/06/2018	212780	<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		<0.001	<0.001		130
0082	0082_MW129_3.5-4.0_191127	MW129	27/11/2019	EP1912546	<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	<0.01	<0.01	<0.01	<1	142
0082	0082_MW129_200623	MW129	23/06/2020	EP2006518	<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	<0.01	<0.01	<0.01	<1	166
0082	0082_MW129_201116	MW129	16/11/2020	EP2012737	<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	<0.01	<0.01	<0.01	<1	156
0082	0082_MW129_3.5-4.0_210621	MW129	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	157
0082	0082_MW130_2.8-3.3_180305	MW130	5/03/2018	207818	<0.001	<0.001	0.002	<0.001	*0.011*	<0.002	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.05	<0.1	<0.02	<0.001	0.02	<0.001	<0.001	<0.1	<0.005	<0.02	<0.005	<0.01	<0.02	<0.05		<0.001			400
0082	0082_MW130_4.8-5.3_180305	MW130	5/03/2018	207818	<0.001	<0.001	0.004	<0.001	*0.048*	<0.002	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.05	<0.1	<0.02	<0.001	0.014	<0.001	<0.001	<0.1	<0.005	<0.02	<0.005	<0.01	<0.02	<0.05		0.1			220
0082	0082_MW130_6.8-7.3_180305	MW130	5/03/2018	207818	<0.001	<0.001	0.002	<0.001	*0.003*	<0.002	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.05	<0.1	<0.02	<0.001	0.02	<0.001	<0.001	<0.1	<0.05	<0.02	<0.005	<0.1	<0.02	<0.05		<0.001			240
0082	0082_MW130_4.8-5.3_180620	MW130	20/06/2018	212780	0.002	0.003	0.072	0.008	*0.16*	<0.002	0.003	0.004	<0.002	<0.001	0.002	<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		0.16	0.25		210
0082	0082_MW130_6.8-7.3_180620	MW130	20/06/2018	212780	<0.001	<0.001	0.003	<0.001	*0.004*	<0.002	0.002	0.003	<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		0.004	0.012		190
0082	0082_MW130_2.8-3.3_180623	MW130	23/06/2018	212780	<0.001	<0.001	0.001	<0.001	*0.004*	<0.002	0.002	0.002	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.004	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.004	0.013		380
0082	0082_MW130_200623	MW130	23/06/2020	EP2006518	<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	<0.01	<0.01	<0.01	<1	160
0082	0082_MW130_201116	MW130	16/11/2020	EP2012737	<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	0.02	0.02	0.02	<1	186
0082	0082_MW130_6.9-7.4_210621	MW130	21/06/2021	EP2107024	<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	0.02	0.02	0.02	<1	185
0082	0082_MW131_2.0-2.5_180310	MW131	10/03/2018	208025	0.001	<0.001	<0.001	<0.001	*0.004*	<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	0.002	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001			800
0082	0082_MW131_4.0-4.5_180310	MW131	10/03/2018	208025	<0.050	<0.050	<0.050	<0.050	<0.050	<0.10	<0.10	<0.050	<0.10	<0.050	<0.050	<0.10	<0.20	<0.050	<2.5	<0.50	<0.10	<0.050	<0.050	<0.050	<0.050	<0.50	<0.20	<0.10	<0.20	<0.50	<0.10	<2.5		<0.001			320
0082	0082_MW131_6.0-6.5_180310	MW131	10/03/2018	208025	<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		<0.001			180
0082	0082_MW131_8.0-8.5_180310	MW131	10/03/2018	208025	<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		<0.001			170
0082	0082_MW131_2.0-2.5_180620	MW131	20/06/2018	212570	<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	<0.1					700
0082	0082_MW131_4.0-4.5_180620	MW131	20/06/2018	212570	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	<0.1					330
0082	0082_MW131_6.0-6.5_180620	MW131	20/06/2018	212570	<0.001	<0.001	<0.001	<0.001	*0.002*	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	<0.002	<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	<0.1					200
0082	0082_MW131_8.0-8.5_180620	MW131	20/06/2018	212570	<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	<0.1					170
0082	0082_MW131_4.0-4.5_191128	MW131	28/11/2019	EP1912609	<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	<0.01	<0.01	<0.01	<1	273
0082	0082_MW131_200623	MW131	23/06/2020	EP2006518	<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	<0.01	<0.01	<0.01	<1	291
0082	0082_MW131_201116	MW131	16/11/2020	EP2012737	<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	0.06	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.08	0.02	0.08	<1	266
0082	0082_MW131_4.0-4.5_210621	MW131	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	32	188
0082	0082_MW132_6.4-6.9_180310	MW132	10/03/2018	208025	0.015	<0.01	0.015	<0.01	<0.01	<0.01	0.01	0.034	<0.02	<0.01	0.025	<0.01	<0.02	<0.01	<0.05	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05		<0.001			210
0082	0082_MW132_8.5-9.0_180310	MW132	10/03/2018	208025	0.003	<0.001	<0.001	<0.001	*0.004*	<0.002	0.01	0.029	<0.002	0.004	0.014	0.009	<0.005	0.005	<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		<0.001			240
0082	0082_MW132_6.4-6.9_180621	MW132	21/06/2018	212780	0.018	0.017	0.032	0.001	*0.002*	<0.002	0.007	0.017	0.003	0.003	0.008	<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		0.01	0.11		230
0082	0082_MW132_8.5-9.0_180621	MW132	21/06/2018	212780	0.002	0.002	0.004	<0.001	<0.001	<0.002	<0.002	0.003	<0.002	<0.001	0.002	<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		0.002	0.013		180
0082	0082_MW132_6.4-6.9_191127	MW132	27/11/2019	EP1912546	0.02	<0.02	0.05	<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	0.07	0.05	0.07	<1	231
0082	0082_MW132_200623	MW132	23/06/2020	EP2006549	<0.02	0.02	0.05	<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	0.05	0.05	0.07	<1	207
0082	0082_MW132_201116	MW132	16/11/2020	EP2012670	<0.02	<0.02	0.04	<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	0.04	0.04	0.04	<1	202
0082	0082_MW132_8.5-9.0_210621	MW132	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	166
0082	0082_MW133_3.0-3.5_180310	MW133	10/03/2018	208025	0.002	<0.001	0.009	<0.001	*0.029*	<0.002	0.008	0.003	<0.002	<0.001	0.006	<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		<0.001			340
0082	0082_MW133_5.0-5.5_180310	MW133	10/03/2018	208025	0.002	<0.001	0.012	<0.001	*0.03*	<0.002	0.01	<0.001	<0.002	<0.001	0.004	<0.002	<0.005	0.002	<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		<0.001			300
0082	0082_MW133_7.0-7.5_180310	MW133	10/03/2018	208025	0.002	0.002	0.011	<0.001	*0.02*	<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	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001			280
0082	0082_MW133_3.0-3.5_180621	MW133	21/06/2018	212780	0.001	0.001	0.01	0.004	*0.02*	<0.002	0.007	0.002	<0.002	<0.001	0.002	<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		0.022	0.047		320
0082	0082_MW133_5.0-5.5_180621	MW133	21/06/2018	212780	0.002	0.002	0.014	0.02	*0.02*	<0.002	0.009	0.001	<0.002	<0.001	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		0.029	0.072		310
0082	0082_MW133_7.0-7.5_180621	MW133	21/06/2018	212780	0.002	0.002	0.014	0.012	*0.008*	<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	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.008	0.044		310
0082	0082_MW133_3.0-3.5_191127	MW133	27/11/2019	EP1912548	<0.02	<0.02	0.04	<0.02	*0.12*	<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	0.35	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.51	0.16	0.51	<1	332
0082	0082_MW133_200623	MW133	23/06/2020	EP2006549	<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	0.03	0.03	0.03	<1	324
0082	0082_MW133_201116	MW133	16/11/2020	EP2012737	<0.02	<0.02	<0.02	<0.02	*0.06*	<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	0.06	0.06	0.06	<1	303
0082	0082_MW133_3.0-3.5_210621	MW133	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	116
0082	0082_MW134_6.6-7.1_180309	MW134	9/03/2018	208025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.05	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05		<0.001			310
0082	0082_MW134_8.6-9.1_180309	MW134	9/03/2018	208025	<0.001	<0.001	<0.01	<0.001	*0.003*	<0.002	0.007	<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		<0.001			310
0082	0082_MW134_6.6-7.1_180622	MW134	22/06/2018	212780	<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		<0.001	<0.001		330
0082	0082_MW134_8.6-9.1_180622	MW134	22/06/2018	212780	<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		0.002	0.004		330

Table 4 - Water Analytical Results

					PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides							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)	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)
					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	µg/L	µg/L	µg/L	mg/L	mg/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	0.01	0.001	0.001	1	1
PFAS NEMP 2020 Interim Marine 99%									*0.00023*						*19*																						
PFAS NEMP 2020 Recreational Water															**10**																			**2**			
Site ID	**Field ID**	**Location Code**	**Date**	**Lab Report Number**																																	
0082	0082_MW134D_191127	MW134	27/11/2019	EP1912549	<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	<0.01	<0.01	<0.01	<1	372
0082	0082_MW134_6.6_200623	MW134	23/06/2020	EP2006519	<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	<0.01	<0.01	<0.01	<1	328
0082	0082_MW134_201117	MW134	17/11/2020	EP2012748	<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	<0.01	<0.01	<0.01	<1	303
0082	0082_MW134_210621	MW134	21/06/2021	EP2107033	<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	<0.01	<0.01	<0.01	<1	312
0082	0082_MW135_8.3-8.8_180309	MW135	9/03/2018	208025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.1	<0.05	<0.02	<0.5		<0.01			
0082	0082_MW135_10.3-10.8_180309	MW135	9/03/2018	208025	<0.001	<0.001	0.002	<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		<0.001			470
0082	0082_MW135_8.3-8.8_180622	MW135	22/06/2018	212780	<0.001	<0.001	0.001	<0.001	*0.007*	<0.002	0.005	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	<0.005	<0.01	<0.002	<0.05		0.007	0.020		510
0082	0082_MW135_10.3-10.8_180622	MW135	22/06/2018	212780	<0.001	<0.001	0.004	<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		0.012	0.017		540
0082	0082_MW135_191127	MW135	27/11/2019	EP1912547	<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	<0.01	<0.01	<0.01	<1	663
0082	0082_MW135_201117	MW135	17/11/2020	EP2012748	<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	<0.01	<0.01	<0.01	<1	623
0082	0082_MW135_210621	MW135	21/06/2021	EP2107028	<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	<0.01	<0.01	<0.01	<1	587
0082	0082_MW137_6.1-6.6_180309	MW137	9/03/2018	208025	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.05	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05		<0.001			490
0082	0082_MW137_8.1-8.6_180309	MW137	9/03/2018	208025	<0.01	<0.01	<0.010	<0.010	*0.015*	<0.01	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.01	<0.05	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05		<0.001			400
0082	0082_MW137_10.1-10.6_180309	MW137	9/03/2018	208025	<0.001	<0.001	0.004	<0.001	*0.013*	<0.002	0.003	0.002	<0.002	<0.001	0.001	<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		<0.001			310
0082	0082_MW137_6.0-6.6_180622	MW137	22/06/2018	212780	<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		0.001	0.001		490
0082	0082_MW137_8.1-8.6_180622	MW137	22/06/2018	212780	<0.001	<0.001	0.001	<0.001	*0.007*	<0.002	0.003	0.002	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.004	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.007	0.017		450
0082	0082_MW137_10.1-10.6_180622	MW137	22/06/2018	212780	<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	0.003	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.005	0.009		310
0082	0082_MW137_6.1-6.6_191127	MW137	27/11/2019	EP1912548	<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	0.27	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.27	<0.01	0.27	<1	449
0082	0082_MW137_200623	MW137	23/06/2020	EP2006549	<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	<0.01	<0.01	<0.01	<1	469
0082	0082_MW137_6.6_201116	MW137	16/11/2020	EP2012669	<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	<0.01	<0.01	<0.01	<1	450
0082	0082_MW137_8.1-8.6_210621	MW137	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	373
0082	0082_MW142_180622	MW142	22/06/2018	212780	0.042	0.090	1.5	0.2	*6.8*	<0.02	0.24	0.77	0.62	0.43	0.59	<0.02	<0.05	0.068	<0.5	<0.1	<0.02	0.011	8	0.033	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		**7.4**	19		380
0082	0082_MW142_191127	MW142	27/11/2019	EP1912547	0.04	0.06	1.08	0.1	*4.56*	<0.02	0.1	0.63	0.41	0.22	0.28	<0.02	<0.02	0.02	<0.05	<0.02	<0.02	<0.05	4.71	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	12	**5.64**	12.2	<1	399
0082	0082_MW142_200623	MW142	23/06/2020	EP2006519	0.08	0.11	1.01	0.13	*6.14*	<0.02	0.2	0.65	0.55	0.27	0.27	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	2.51	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	11.7	**7.15**	12.0	<1	377
0082	0082_MW142_201117	MW142	17/11/2020	EP2012739	0.03	0.05	0.74	0.06	*5.92*	<0.02	0.1	0.33	0.29	0.12	0.14	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	1.22	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	8.89	**6.66**	9.00	<1	358
0082	0082_MW142_210621	MW142	21/06/2021	EP2107028	0.42	0.46	3.27	1.07	*48.6*	<0.02	1.7	3.47	4.47	1.28	0.74	<0.02	<0.02	0.16	<0.05	<0.02	<0.02	<0.05	4.74	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	68.7	**51.9**	70.4	<1	303
0082	0082_MW143_180623	MW143	23/06/2018	212780	0.042	0.10	0.73	0.11	*4.1*	<0.02	0.44	1.1	1.1	0.79	0.48	<0.02	<0.05	0.017	<0.5	<0.1	<0.02	<0.01	0.99	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		**4.6**	10		400
0082	0082_MW143_191127	MW143	27/11/2019	EP1912547	<0.02	0.04	0.55	0.12	*8.93*	<0.02	0.4	1.18	0.96	0.69	0.47	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.92	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	14.1	**9.48**	14.3	<1	394
0082	0082_MW143_200623	MW143	23/06/2020	EP2006519	0.06	0.08	0.66	0.1	*4.69*	<0.02	0.4	1.12	1.09	0.69	0.39	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	1.22	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	10.3	**5.35**	10.5	18	455
0082	0082_MW143_201117	MW143	17/11/2020	EP2012739	0.04	0.05	0.53	0.11	*4.81*	<0.02	0.4	0.92	1.03	0.57	0.37	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.87	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	9.54	**5.34**	9.70	13	429
0082	0082_MW143_210621	MW143	21/06/2021	EP2107028	0.06	0.06	0.66	0.08	*2.7*	<0.02	0.3	0.95	0.95	0.46	0.3	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	1.48	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	7.86	**3.36**	8.00	6	401
0082	0082_MW144S_180623	MW144S	23/06/2018	212780	0.26	0.29	1.9	0.11	*4*	<0.02	0.68	1.9	1.9	1.4	0.6	0.005	<0.05	0.19	<0.5	<0.1	<0.02	<0.01	0.7	0.15	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		**4.6**	14		540
0082	0082_MW144_S_191128	MW144S	28/11/2019	EP1912606	0.24	0.29	2.47	0.13	*9.86*	<0.02	0.8	1.99	2.14	1.55	0.66	<0.02	<0.02	0.28	<0.05	<0.02	<0.02	<0.05	0.61	0.14	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	20.5	**12.3**	21.2	<1	635
0082	0082_MW144S_200625	MW144S	25/06/2020	EP2006593	0.22	0.31	1.92	0.09	*6.06*	<0.02	0.5	1.61	1.47	1.41	0.55	<0.02	<0.02	0.23	<0.05	<0.02	<0.02	<0.05	0.3	0.3	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	14.3	**7.98**	15.0	<1	591
0082	0082_MW144_S_201117	MW144S	17/11/2020	EP2012739	0.20	0.28	2.09	0.09	*5.97*	<0.02	0.6	1.46	1.43	1.48	0.58	<0.02	<0.02	0.24	<0.05	<0.02	<0.02	<0.05	0.33	0.35	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	14.5	**8.06**	15.1	<1	556
0082	0082_MW144S_210621	MW144S	21/06/2021	EP2107033	0.27	0.36	2.89	0.17	*8.36*	<0.02	0.7	2.22	2.44	2.08	0.95	<0.02	<0.02	0.35	<0.05	<0.02	<0.02	<0.05	0.54	0.16	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	20.6	**11.2**	21.5	<1	647
0082	0082_MW145_180620	MW145	20/06/2018	212570	0.41	0.61	2.4	0.051	*0.19*	<0.002	0.13	1.9	0.38	0.17	0.12	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	0.031	<0.001	<0.001	<0.02	<0.01	<0.004	<0.01	<0.02	<0.004	<0.1					280
0082	0082_MW145_191127	MW145	27/11/2019	EP1912549	<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	<0.01	<0.01	<0.01	<1	256
0082	0082_MW145_200625	MW145	25/06/2020	EP2006593	<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	<0.01	<0.01	<0.01	<1	257
0082	0082_MW145_201117	MW145	17/11/2020	EP2012738	<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	<0.01	<0.01	<0.01	<1	248
0082	0082_MW145_210621	MW145	21/06/2021	EP2107028	<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	<0.01	<0.01	<0.01	<1	252
0082	0082_MW147_180621	MW147	21/06/2018	212780	<0.001	0.001	0.007	<0.001	*0.008*	<0.002	<0.002	0.004	<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		0.008	0.020		180
0082	0082_MW147_191127	MW147	27/11/2019	EP1912549	<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	<0.01	<0.01	<0.01	<1	251
0082	0082_MW147_201117	MW147	17/11/2020	EP2012748	<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	<0.01	<0.01	<0.01	<1	290
0082	0082_MW147_210622	MW147	22/06/2021	EP2107183	<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	<0.01	<0.01	<0.01	<1	306
0082	0082_MW148S_180621	MW148S	21/06/2018	212780	<0.001	<0.001	0.002	<0.001	*0.006*	<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		0.006	0.008		290
0082	0082_MW148S_191127	MW148S	27/11/2019	EP1912549	<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	<0.01	<0.01	<0.01	<1	313
0082	0082_MW148S_200623	MW148S	23/06/2020	EP2006519	<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	0.01	0.01	0.01	<1	386
0082	0082_MW148S_201117	MW148S	17/11/2020	EP2012748	<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	<0.01	<0.01	<0.01	<1	295
0082	0082_MW148S_210621	MW148S	21/06/2021	EP2107033	<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	<0.01	<0.01	<0.01	<1	333
0082	0082_MW151S_180621	MW151S	21/06/2018	212780	<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		<0.001	<0.001		260
0082	0082_MW151S_191127	MW151S	27/11/2019	EP1912546	<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	<0.01	<0.01	<0.01	<1	236
0082	0082_MW151S_200623	MW151S	23/06/2020	EP2006518	<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	<0.01	<0.01	<0.01	<1	1,700
0082	0082_MW151_S_201116	MW151S	16/11/2020	EP2012737	<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	<0.01	<0.01	<0.01	<1	213
0082	0082_MW151S_210621	MW151S	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	236
0082	0082_MW152S_180621	MW152S	21/06/2018	212780	<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		<0.001	0.003		210
0082	0082_MW152S_191127	MW152S	27/11/2019	EP1912546	<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	<0.01	<0.01	<0.01	<1	245
0082	0082_MW152S_200623	MW152S	23/06/2020	EP2006518	<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	<0.01	<0.01	<0.01	<1	243
0082	0082_MW152S_201116	MW152S	16/11/2020	EP2012669	<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	<0.01	<0.01	<0.01	<1	182
0082	0082_MW152S_210622	MW152S	22/06/2021	EP2107092	<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	<0.01	<0.01	<0.01	<1	228
0082	0082_MW153S_180622	MW153S	22/06/2018	212780	<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		<0.001	0.004		240
0082	0082_MW153S_191128	MW153S	28/11/2019	EP1912599	<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	0.29	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.29	<0.01	0.29	<1	345
0082	0082_MW153S_200623	MW153S	23/06/2020	EP2006518	<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	<0.01	<0.01	<0.01	<1	376
0082	0082_MW153S_201116	MW153S	16/11/2020	EP2012669	<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	<0.01	<0.01	<0.01	<1	370
0082	0082_MW153S_210622	MW153S	22/06/2021	EP2107086	<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	<0.01	<0.01	<0.01	<1	288
0082	0082_MW154S_180620	MW154S	20/06/2018	212780	0.071	0.076	0.43	0.02	*0.25*	<0.002	0.034	0.1	0.071	0.036	0.033	<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		0.28	1.1		380
0082	0082_MW154S_191127	MW154S	27/11/2019	EP1912548	0.07	0.06	0.28	<0.02	*0.22*	<0.02	<0.1	0.08	0.05	0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.1	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.84	0.5	0.90	<1	379
0082	0082_MW154S_200623	MW154S	23/06/2020	EP2006549	0.12	0.16	0.52	0.02	*0.42*	<0.02	<0.1	0.14	0.12	0.05	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	1.42	0.94	1.60	<1	330
0082	0082_MW154S_201116	MW154S	16/11/2020	EP2012669	0.11	0.12	0.56	0.03	*0.73*	<0.02	<0.1	0.14	0.09	0.06	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	1.74	1.29	1.89	<1	399
0082	0082_MW154S_210621	MW154S	21/06/2021	EP2107033	0.13	0.11	0.53	0.03	*0.54*	<0.02	<0.1	0.14	0.14	0.06	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	1.59	1.07	1.73	<1	432
0082	0082_MW155S_180622	MW155S	22/06/2018	212780	<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		<0.001	<0.001		490
0082	0082_MW155S_191127	MW155S	27/11/2019	EP1912548	<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	0.16	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.16	<0.01	0.16	<1	508
0082	0082_MW155S_200623	MW155S	23/06/2020	EP2006549	<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	<0.01	<0.01	<0.01	<1	503
0082	0082_MW155S_201116	MW155S	16/11/2020	EP2012669	<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	<0.01	<0.01	<0.01	<1	481
0082	0082_MW155S_210621	MW155S	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	462
0082	0082_BDDBO20_180309	MW310	9/03/2018	208025	1.4	1.6	5.9	0.1	*0.78*	<0.002	1.2	5.5	3	1.2	0.16	<0.002	<0.005	0.004	<0.05	<0.01	<0.002	0.007	0.38	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		**6.7**			740
0082	0082_B020_180618	MW310	18/06/2018	212373	1.7	2.1	6.7	0.094	*0.66*	<0.002	1.3	6.9	3.3	1.2	0.17	<0.002	<0.005	0.006	<0.05	<0.01	<0.002	0.009	0.44	0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		**7.4**			740
0082	0082_B020_191127	MW310	27/11/2019	EP1912547	1.05	0.96	1.51	0.04	*0.32*	<0.02	0.7	4	1.73	0.28	0.07	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.56	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	10.2	1.83	11.2	<1	757
0082	0082_MW310_200623	MW310	23/06/2020	EP2006519	1.71	2.56	4.74	0.09	*0.82*	<0.02	1	6.62	3.52	1.12	0.17	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.07	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	19.8	**5.56**	22.4	<1	701
0082	0082_MW310_201117	MW310	17/11/2020	EP2012739	2.39	1.78	3.04	0.06	*0.65*	<0.02	1.3	7.35	3.88	0.64	0.12	<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	19.4	**3.69**	21.2	<1	694
0082	0082_MW310_210621	MW310	21/06/2021	EP2107028	1.50	2.36	12	0.27	*3.66*	<0.02	1	7.21	3.66	1.36	0.34	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.44	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	31.2	**15.7**	33.8	<1	660
0082	0082_B021_180618	MW311	18/06/2018	212373	0.023	0.032	0.26	0.019	*0.38*	<0.002	0.15	2.1	0.36	0.09	0.032	<0.002	<0.005	0.004	<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		0.64			260
0082	0082_B021_191127	MW311	27/11/2019	EP1912547	0.03	0.03	0.33	<0.02	*0.41*	<0.02	0.1	0.3	0.31	0.08	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	1.59	0.74	1.62	<1	304
0082	0082_MW311_200623	MW311	23/06/2020	EP2006519	0.04	0.06	0.42	<0.02	*0.52*	<0.02	0.2	0.4	0.51	0.15	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	2.3	0.94	2.36	<1	407
0082	0082_MW311_201117	MW311	17/11/2020	EP2012739	0.03	0.04	0.36	<0.02	*0.55*	<0.02	0.2	0.35	0.48	0.12	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	2.14	0.91	2.18	<1	338
0082	0082_MW311_210621	MW311	21/06/2021	EP2107028	<0.02	<0.02	0.49	<0.02	*0.26*	<0.02	<0.1	0.24	0.19	0.17	0.08	<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	1.43	0.75	1.43	<1	227
0082	0082_BA1_180222	MW315	22/02/2018	207359	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					680
0082	0082_BA1_180610	MW315	10/06/2018	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		0.002			640
0082	0082_BA1_191127	MW315	27/11/2019	EP1912547	<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	<0.01	<0.01	<0.01	15	737
0082	0082_MW315_200625	MW315	25/06/2020	EP2006593	<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	<0.01	<0.01	<0.01	17	761
0082	0082_MW315_201117	MW315	17/11/2020	EP2012738	<0.02	<0.02	0.02	<0.02	*0.1*	<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	0.12	0.12	0.12	12	689
0082	0082_MW315_210621	MW315	21/06/2021	EP2107033	<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	<0.01	<0.01	<0.01	10	666
0082	0082_BB8_180222	MW326	22/02/2018	207359	0.008	0.005	0.029	<0.001	*0.007*	<0.002	0.007	0.003	0.003	0.001	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					370
0082	0082_BB8_180621	MW326	21/06/2018	212780	0.008	0.004	0.012	0.003	*0.01*	<0.002	0.006	0.002	<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		0.013	0.048		400
0082	0082_BB8_191128	MW326	28/11/2019	EP1912606	<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	0.03	0.03	0.03	<1	466
0082	0082_MW326_200623	MW326	23/06/2020	EP2006519	<0.02	<0.02	0.05	<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	0.06	0.06	0.06	<1	405
0082	0082_MW326_201117	MW326	17/11/2020	EP2012738	<0.02	<0.02	0.06	<0.02	*0.07*	<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	0.13	0.13	0.13	<1	429
0082	0082_MW326_210621	MW326	21/06/2021	EP2107028	<0.02	<0.02	0.06	<0.02	*0.02*	<0.02	<0.1	<0.02	<0.02	<0.02	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	0.1	0.08	0.10	<1	569
0082	0082_OTH101_180226	OTH101	26/02/2018	207529	<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					380
0082	0082_OTH101_A_180621	OTH101	21/06/2018	212780	<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		<0.001	<0.001		130
0082	0082_OTH101_B_180621	OTH101	21/06/2018	212780	<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		<0.001	<0.001		130
0082	0082_OTH101_191128	OTH101	28/11/2019	EP1912609	<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	<0.01	<0.01	<0.01	<1	136
0082	0082_OTH101_200626	OTH101	26/06/2020	EP2006685	<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	<0.01	<0.01	<0.01	<1	128
0082	0082_OTH101_201116	OTH101	16/11/2020	EP2012670	<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	<0.01	<0.01	<0.01	<1	116
0082	0082_OTH101_210621	OTH101	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	119
0082	0082_OTH102_180226	OTH102	26/02/2018	207529	<0.001	<0.001	<0.001	<0.001	*0.006*	<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					1,200
0082	0082_OTH102_A_180621	OTH102	21/06/2018	212780	<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		<0.001	<0.001		120
0082	0082_OTH102_B_180621	OTH102	21/06/2018	212780	<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		<0.001	<0.001		120
0082	0082_OTH102_191128	OTH102	28/11/2019	EP1912609	<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	<0.01	<0.01	<0.01	<1	129
0082	0082_OTH102_200626	OTH102	26/06/2020	EP2006685	<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	0.01	0.01	0.01	<1	125
0082	0082_OTH102_201116	OTH102	16/11/2020	EP2012670	<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	<0.01	<0.01	<0.01	<1	124
0082	0082_OTH102_210621	OTH102	21/06/2021	EP2107024	<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	<0.01	<0.01	<0.01	<1	133
0082	0082_OTH103_180226	OTH103	26/02/2018	207529	<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					880
0082	0082_OTH103_A_180621	OTH103	21/06/2018	212780	<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		<0.001	<0.001		130

Table 4 - Water Analytical Results

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides							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)	Perfluoroheanoic 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)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate 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	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	mg/L	mg/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	0.01	0.001	0.001	1	1
PFAS NEMP 2020 Interim Marine 99%					*0.00023*						*19*																						
PFAS NEMP 2020 Recreational Water											**10**																				**2**		

Site ID	Field ID	Location Code	Date	Lab Report Number																															
0082	**0082_OTH103_B_180621**	**OTH103**	**21/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		130
0082	**0082_OTH103_191128**	**OTH103**	**28/11/2019**	**EP1912609**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	126
0082	**0082_OTH103_200626**	**OTH103**	**26/06/2020**	**EP2006685**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	129
0082	**0082_OTH103_201116**	**OTH103**	**16/11/2020**	**EP2012670**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	122
0082	**0082_OTH103_210621**	**OTH103**	**21/06/2021**	**EP2107024**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	129
0082	**0082_OTH104_180226**	**OTH104**	**26/02/2018**	**207529**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05					800
0082	**0082_OTH104_A_180621**	**OTH104**	**21/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		120
0082	**0082_OTH104_B_180621**	**OTH104**	**21/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		120
0082	**0082_OTH104_191128**	**OTH104**	**28/11/2019**	**EP1912609**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	170
0082	**0082_OTH104_200626**	**OTH104**	**26/06/2020**	**EP2006685**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	135
0082	**0082_OTH104_201116**	**OTH104**	**16/11/2020**	**EP2012670**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	127
0082	**0082_OTH104_210621**	**OTH104**	**21/06/2021**	**EP2107024**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	135
0082	**0082_OTH105_180226**	**OTH105**	**26/02/2018**	**207529**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05					640
0082	**0082_OTH105_A_180621**	**OTH105**	**21/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		120
0082	**0082_OTH105_B_180621**	**OTH105**	**21/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		120
0082	**0082_OTH105_191128**	**OTH105**	**28/11/2019**	**EP1912609**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	129
0082	**0082_OTH105_200626**	**OTH105**	**26/06/2020**	**EP2006685**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	132
0082	**0082_OTH105_201116**	**OTH105**	**16/11/2020**	**EP2012670**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	121
0082	**0082_OTH105_210621**	**OTH105**	**21/06/2021**	**EP2107024**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	134
0082	**0082_OTH106_180226**	**OTH106**	**26/02/2018**	**207529**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05					530
0082	**0082_OTH106_A_180621**	**OTH106**	**21/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		130
0082	**0082_OTH106_B_180621**	**OTH106**	**21/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		130
0082	**0082_OTH106_191128**	**OTH106**	**28/11/2019**	**EP1912609**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	115
0082	**0082_OTH106_200626**	**OTH106**	**26/06/2020**	**EP2006685**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	214
0082	**0082_OTH106_201116**	**OTH106**	**16/11/2020**	**EP2012670**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	120
0082	**0082_OTH106_210621**	**OTH106**	**21/06/2021**	**EP2107024**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	162
0082	**0082_SW161_180225**	**SW161**	**25/02/2018**	**207529**	<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	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05					170
0082	**0082_SW161_180623**	**SW161**	**23/06/2018**	**212780**	<0.001	<0.001	<0.001	<0.001	*0.008*	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.008	0.01		62
0082	**0082_SW161_200526**	**SW161**	**26/05/2020**	**EP2005403**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	124
0082	**0082_SW161_200623**	**SW161**	**23/06/2020**	**EP2006451**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	30	101
0082	**0082_SW161_210303**	**SW161**	**3/03/2021**	**EP2102193**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	78
0082	**0082_SW161_210621**	**SW161**	**21/06/2021**	**EP2107025**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	80
0082	**0082_SW162_180225**	**SW162**	**25/02/2018**	**207529**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05					260
0082	**0082_SW162_180623**	**SW162**	**23/06/2018**	**212780**	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		<0.001	<0.001		67
0082	**0082_SW162_200526**	**SW162**	**26/05/2020**	**EP2005403**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	124
0082	**0082_SW162_200623**	**SW162**	**23/06/2020**	**EP2006451**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	119
0082	**0082_SW162_210303**	**SW162**	**3/03/2021**	**EP2102193**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	125
0082	**0082_SW162_210621**	**SW162**	**21/06/2021**	**EP2107025**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	89
0082	**0082_SW163_180223**	**SW163**	**23/02/2018**	**207359**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.1	<0.05	<0.02	<0.5					200
0082	**0082_SW163_180623**	**SW163**	**23/06/2018**	**212780**	<0.001	<0.001	<0.001	<0.001	*0.008*	<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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.008	0.008		76
0082	**0082_SW163_200526**	**SW163**	**26/05/2020**	**EP2005403**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	125
0082	**0082_SW163_200623**	**SW163**	**23/06/2020**	**EP2006451**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	125
0082	**0082_SW163_210303**	**SW163**	**3/03/2021**	**EP2102193**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	132
0082	**0082_SW163_210621**	**SW163**	**21/06/2021**	**EP2107025**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	87
0082	**0082_SW164_180312**	**SW164**	**12/03/2018**	**208025**	0.003	0.004	0.026	0.003	*0.13*	<0.002	0.022	0.038	0.04	0.011	0.01	0.003	<0.005	0.005	<0.05	<0.01	<0.002	<0.001	0.049	0.047	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.2			41
0082	**0082_SW164_180619**	**SW164**	**19/06/2018**	**212570**	0.002	0.002	0.012	0.001	*0.056*	<0.002	0.005	0.012	0.01	0.004	0.003	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	0.027	0.016	<0.001	<0.02	<0.01	<0.004	<0.01	<0.02	<0.004	<0.1					38
0082	**0082_SW164_200525**	**SW164**	**25/05/2020**	**EP2005398**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.04	0.04	0.04	<1	32
0082	**0082_SW181_180608**	**SW181**	**8/06/2018**	**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	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	<0.05		0.005			130
0082	**0082_SW181_191128**	**SW181**	**28/11/2019**	**EP1912602**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	86	105
0082	**0082_SW181_200526**	**SW181**	**26/05/2020**	**EP2005403**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	123
0082	**0082_SW181_200623**	**SW181**	**23/06/2020**	**EP2006521**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	191
0082	**0082_SW181_201116**	**SW181**	**16/11/2020**	**EP2012672**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	**36**	111
0082	**0082_SW181_210303**	**SW181**	**3/03/2021**	**EP2102193**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	103
0082	**0082_SW181_210621**	**SW181**	**21/06/2021**	**EP2107025**	<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	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	172

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

Table 4 - Water Analytical Results

	Inorganics															Metals			Organic
	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	Sulphate (filtered)	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
	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	mg/L
LOR - Limit of Reporting	1	1	0.01	0.01	1	0.01	0.01	0.5	1	1	1	1	1	5	0.1	0.1	0.1	1
PFAS NEMP 2020 Interim Marine 99%																		
PFAS NEMP 2020 Recreational Water																		

Site ID	Field ID	Location Code	Date	Lab Report Number																
0082	0082_MW22_180221	MW022	21/02/2018	207287					230	-0.76	7.7	220		78		880			40	32	20	
0082	0082_MW22_180609	MW022	9/06/2018	212095					170	-0.046		210		65		810			33	25	21	
0082	0082_MW22_191127	MW022	27/11/2019	EP1912548	<1	364	11.8	11.2	117	2.72	7.93	151	60			644		770	36	26	27	9
0082	0082_MW022_200623	MW022	23/06/2020	EP2006549	<1	402	13.1	12.1	144	3.90	8.11	159	49			704		134	35	30	39	6
0082	0082_MW022_210622	MW022	22/06/2021	EP2107092	<1	381	12.2	12.0	125	0.95	8.05	183	51			698		406	24	23	36	6
0082	0082_MW103D_180309	MW103D	9/03/2018	208025					1,300	-2.3		580		180		3,100			180	93	18	
0082	0082_MW103D_180609	MW103D	9/06/2018	212095					1,300	-0.49		570		170		3,100			200	100	16	
0082	0082_MW103D_191127	MW103D	27/11/2019	EP1912547	<1	173	41.8	43.5	1,230	1.99	7.79	535	177			3,220		221	202	116	25	2
0082	0082_MW103D_200623	MW103D	23/06/2020	EP2006519	<1	233	57.8	57.1	1,760	0.63	7.53	676	170			3,640		6,630	275	161	29	2
0082	0082_MW103D_201117	MW103D	17/11/2020	EP2012738	<1	227	61.6	58.6	1,900	2.54	7.65	692	169			4,730		666	288	162	31	2
0082	0082_MW103D_210621	MW103D	21/06/2021	EP2107028	<1	245	55.0	69.2	1,660	11.5	7.49	805	156			6,030		108	337	200	37	<1
0082	0082_MW105S_180309	MW105S	9/03/2018	208025					390	-2.8		360		140		1,400			37	39	40	
0082	0082_MW105S_180604	MW105S	4/06/2018	211639					270	-2.8		290		110		1,100			31	38	38	
0082	0082_MW105S_191127	MW105S	27/11/2019	EP1912547	<1	426	32.5	34.2	703	2.49	7.93	505	200			2,250	59	34,600	67	89	60	
0082	0082_MW105S_210621	MW105S	21/06/2021	EP2107028	<1	813	51.8	51.8	1,060	0.02	7.95	984	273			3,110		2,020	29	66	85	5
0082	0082_MW109_180308	MW109	8/03/2018	208025					2,600	-0.95		2,000		780		6,000			69	78	54	
0082	0082_MW109_180618	MW109	18/06/2018	212373					2,500	-4.2		1,900		920		5,900			53	75	56	
0082	0082_MW109_191127	MW109	27/11/2019	EP1912549	<1	577	102	98.0	2,630	1.99	8.08	1,970	783			6,010		1,720	57	84	101	8
0082	0082_MW109_200623	MW109	23/06/2020	EP2006519	<1	594	109	101	2,880	3.69	7.89	2,040	760			6,060		49,400	57	88	92	5
0082	0082_MW109_201117	MW109	17/11/2020	EP2012738	<1	605	112	104	2,960	3.74	7.92	2,080	794			6,300		3,190	66	92	105	3
0082	0082_MW109_210621	MW109	21/06/2021	EP2107033	<1	491	120	115	3,240	2.18	7.99	2,350	900			6,920	8	1,790	44	91	114	
0082	0082_MW113_180310	MW113	10/03/2018	208025					680	-0.48		600		180		1,900			27	29	31	
0082	0082_MW113_180609	MW113	9/06/2018	212095					650	-3.0		640		170		1,900			25	29	32	
0082	0082_MW113_191127	MW113	27/11/2019	EP1912547	<1	534	33.6	31.6	678	3.04	8.10	622	181			2,140		15,300	23	28	42	6
0082	0082_MW113_200623	MW113	23/06/2020	EP2006519	<1	564	35.1	30.2	709	7.45	8.17	595	185			2,020		603	22	27	41	2
0082	0082_MW113_201117	MW113	17/11/2020	EP2012738	<1	522	34.3	31.4	703	4.46	8.17	613	193			2,110		63,000	24	30	40	2
0082	0082_MW113_210621	MW113	21/06/2021	EP2107028	<1	543	35.1	32.7	736	3.54	8.13	664	169			2,100		315	16	23	45	4
0082	0082_MW115_180308	MW115	8/03/2018	208025					1,500	-0.82		710		140		3,300			110	140	84	
0082	0082_MW115_180609	MW115	9/06/2018	212095					1,500	0.021		720		140		3,400			110	140	75	
0082	0082_MW115_191127	MW115	27/11/2019	EP1912547	<1	300	48.4	52.6	1,320	4.26	7.76	738	246			3,110		40	117	148	99	7
0082	0082_MW115_200623	MW115	23/06/2020	EP2006519	<1	308	48.7	47.9	1,330	0.79	7.76	692	242			3,160		260	98	131	85	6
0082	0082_MW115_201117	MW115	17/11/2020	EP2012738	<1	304	52.8	50.7	1,440	2.06	7.76	733	294			3,010		912	109	134	91	3
0082	0082_MW115_210621	MW115	21/06/2021	EP2107028	<1	294	47.7	47.2	1,310	0.57	7.66	705	234			3,040		414	101	114	81	3
0082	0082_MW118D_180305	MW118D	5/03/2018	207818					790	-2.1		750		200		2,400			21	27	39	
0082	0082_MW118D_180609	MW118D	9/06/2018	212095					660	-0.39		640		120		1,900			22	28	37	
0082	0082_MW118D_191127	MW118D	27/11/2019	EP1912548	<1	590	36.8	35.4	782	1.92	8.20	716	140			2,630		4,800	17	25	52	9
0082	0082_MW118D_200623	MW118D	23/06/2020	EP2006549	<1	674	44.9	42.8	976	2.32	8.27	882	187			2,650		1,380	18	25	60	4
0082	0082_MW118D_201116	MW118D	16/11/2020	EP2012669	<1	657	45.0	42.3	982	3.15	8.24	870	202			2,620	1	442	17	25	60	
0082	0082_MW118D_210621	MW118D	21/06/2021	EP2107033	<1	672	65.0	64.3	1,630	0.56	8.08	1,270	271			3,840		148	28	67	85	<1
0082	0082_MW122_180305	MW122	5/03/2018	207818					2,500	-2.3		1,900		810		5,400			44	66	50	
0082	0082_MW122_180616	MW122	16/06/2018	212373					2,200	-4		1,800		760		5,400			35	65	50	
0082	0082_MW122_191127	MW122	27/11/2019	EP1912549	<1	773	98.1	91.0	2,460	3.77	8.11	1,860	638			5,550		2,950	35	74	88	9
0082	0082_MW122_200623	MW122	23/06/2020	EP2006549	<1	820	95.2	90.4	2,380	2.58	8.04	1,870	562			5,210		187	30	67	81	4
0082	0082_MW122_201116	MW122	16/11/2020	EP2012669	<1	700	90.1	83.6	2,260	3.77	8.08	1,730	596			5,140	2	948	31	58	79	
0082	0082_MW122_210622	MW122	22/06/2021	EP2107092	<1	687	89.6	85.5	2,230	2.34	7.98	1,770	624			5,300		565	28	61	83	5
0082	0082_MW126_180305	MW126	5/03/2018	207818					220	0.068		160		68		740			32	19	17	
0082	0082_MW126_180616	MW126	16/06/2018	212373					67	1.9		62		43		400			34	18	12	
0082	0082_MW126_191127	MW126	27/11/2019	EP1912546	<1	405	30.3	28.5	649	3.05	7.97	536	186			1,760		2,410	41	27	35	5
0082	0082_MW126_200623	MW126	23/06/2020	EP2006549	<1	385	49.1	46.1	1,330	3.16	8.00	887	187			2,810		438	55	43	48	6
0082	0082_MW126_210621	MW126	21/06/2021	EP2107033	<1	409	24.7	26.2	505	2.91	7.90	474	109			1,400		69	47	29	32	2
0082	0082_MW128_4.2_180305	MW128	5/03/2018	207818					21,000	3.2		13,000		3,500		40,000			570	1,400	430	
0082	0082_MW128_6.2_180305	MW128	5/03/2018	207818					20,000	4.5		13,000		3,400		40,000			610	1,300	420	
0082	0082_MW128_8.2_180305	MW128	5/03/2018	207818					21,000	1.5		12,000		3,600		41,000			510	1,400	420	
0082	0082_MW128_3.7-4.2_180615	MW128	15/06/2018	212373					20,000	2.6		12,000		2,900		40,000			540	1,300	400	
0082	0082_MW128_5.7-6.2_180615	MW128	15/06/2018	212373					20,000	0.68		12,000		2,800		40,000			460	1,300	390	
0082	0082_MW128_7.7-8.2_180615	MW128	15/06/2018	212373					21,000	1		12,000		2,800		41,000			460	1,300	410	
0082	0082_MW128_3.7-4.2_191127	MW128	27/11/2019	EP1912546	<1	105	628	740	20,000	8.21	7.74	12,900	2,970			38,800		10,600	591	1,600	711	5
0082	0082_MW128_200623	MW128	23/06/2020	EP2006518	<1	183	624	696	19,900	5.49	7.59	12,300	2,830			43,300		7,770	513	1,480	549	6
0082	0082_MW128_201116	MW128	16/11/2020	EP2012670	<1	185	625	702	19,800	5.79	7.71	12,200	3,030			42,700	14.13	67,200	540	1,550	666	
0082	0082_MW128_3.7-4.2_210621	MW128	21/06/2021	EP2107024	<1	220	607	722	19,500	8.66	7.51	12,500	2,540			39,900	32	57,700	588	1,610	664	
0082	0082_MW129_3.5-4.0_180305	MW129	5/03/2018	207818					21,000	3.3		13,000		3,500		40,000			500	1,400	440	
0082	0082_MW129_5.5-6.0_180305	MW129	5/03/2018	207818					21,000	1		13,000		3,700		40,000			500	1,400	430	
0082	0082_MW129_7.5-8.0_180305	MW129	5/03/2018	207818					21,000	2.9		13,000		3,700		41,000			480	1,500	450	
0082	0082_MW129_3.5-4.0_180621	MW129	21/06/2018	212780					22,000	-1.9		12,000		2,800		40,000			440	1,300	390	
0082	0082_MW129_5.5-6.0_180621	MW129	21/06/2018	212780					22,000	-2.9		12,000		2,800		40,000			420	1,300	390	
0082	0082_MW129_7.5-8.0_180621	MW129	21/06/2018	212780					22,000	-1.1		12,000		2,900		41,000			430	1,400	420	
0082	0082_MW129_3.5-4.0_191127	MW129	27/11/2019	EP1912546	<1	142	561	723	17,800	12.6	7.59	12,600	2,710			38,900		21	530	1,600	658	2
0082	0082_MW129_200623	MW129	23/06/2020	EP2006518	<1	166	623	671	19,900	3.71	7.72	11,900	2,800			43,100		277	475	1,410	530	2
0082	0082_MW129_201116	MW129	16/11/2020	EP2012737	<1	156	644	698	20,700	3.96	7.83	12,100	2,760			41,900		1,020	522	1,560	662	<1
0082	0082_MW129_3.5-4.0_210621	MW129	21/06/2021	EP2107024	<1	157	603	696	19,400	7.17	7.73	12,000	2,520			40,500		213	537	1,590	641	
0082	0082_MW130_2.8-3.3_180305	MW130	5/03/2018	207818					13,000	0.86		7,600		2,200		25,000			430	690	210	
0082	0082_MW130_4.8-5.3_180305	MW130	5/03/2018	207818					15,000	4.4		9,600		2,600		30,000			470	980	300	
0082	0082_MW130_6.8-7.3_180305	MW130	5/03/2018	207818					15,000	14		12,000		2,700		30,000			530	1,300	400	
0082	0082_MW130_4.8-5.3_180620	MW130	20/06/2018	212780					18,000	9.0		12,000		2,400		38,000			550	1,300	390	
0082	0082_MW130_6.8-7.3_180620	MW130	20/06/2018	212780					19,000	11		13,000		2,400		37,000			570	1,400	380	
0082	0082_MW130_2.8-3.3_180623	MW130	23/06/2018	212780					9,100	0.43		5,300		1,100		18,000			280	490	160	
0082	0082_MW130_200623	MW130	23/06/2020	EP2006518	<1	160	589	617	18,900	2.28	7.70	10,900	2,550			39,200		1,790	493	1,290	471	8
0082	0082_MW130_201116	MW130	16/11/2020	EP2012737	<1	186	616	634	19,800	1.50	7.85	11,000	2,570			35,200		602	527	1,400	568	3
0082	0082_MW130_6.9-7.4_210621	MW130	21/06/2021	EP2107024	<1	185	559	649	18,000	7.44	7.65	11,200	2,280			36,600		247	565	1,450	552	5
0082	0082_MW131_2.0-2.5_180310	MW131	10/03/2018	208025					3,600	-1.1		2,300		450		7,500			130	180	81	
0082	0082_MW131_4.0-4.5_180310	MW131	10/03/2018	208025					16,000	-1.1		9,300		2,700		33,000			550	810	250	
0082	0082_MW131_6.0-6.5_180310	MW131	10/03/2018	208025					19,000	-6.4		9,500		2,700		37,000			400	1,100	330	
0082	0082_MW131_8.0-8.5_180310	MW131	10/03/2018	208025					20,000	-1.1		11,000		2,600		37,000			430	1,200	380	
0082	0082_MW131_2.0-2.5_180620	MW131	20/06/2018	212570					4,600	2.3		3,100		680		9,300			170	220	97	
0082	0082_MW131_4.0-4.5_180620	MW131	20/06/2018	212570					17,000	2.1		10,000		2,500		35,000			550	1,000	290	
0082	0082_MW131_6.0-6.5_180620	MW131	20/06/2018	212570					19,000	5.6		12,000		2,600		38,000			490	1,300	400	
0082	0082_MW131_8.0-8.5_180620	MW131	20/06/2018	212570					19,000	4.9		12,000		2,900		40,000			440	1,300	410	
0082	0082_MW131_4.0-4.5_191128	MW131	28/11/2019	EP1912609	<1	273	507	574	16,000	6.15	7.68	9,870	2,420			31,600		116	559	1,270	466	8
0082	0082_MW131_200623	MW131	23/06/2020	EP2006518	<1	291	523	547	16,600	2.22	7.61	9,480	2,350			34,400		167	525	1,160	498	9
0082	0082_MW131_201116	MW131	16/11/2020	EP2012737	<1	266	554	591	17,700	3.26	7.70	10,100	2,370			35,600		240	586	1,330	519	6
0082	0082_MW131_4.0-4.5_210621	MW131	21/06/2021	EP2107024	<1	220	14.5	12.7	275	6.59	8.85	234	115			932		68	23	12	17	15
0082	0082_MW132_6.4-6.9_180310	MW132	10/03/2018	208025					18,000	0.021		10,000		2,400		35,000			500	1,100	330	
0082	0082_MW132_8.5-9.0_180310	MW132	10/03/2018	208025					19,000	-1.2		11,000		2,600		38,000			540	1,100	340	
0082	0082_MW132_6.4-6.9_180621	MW132	21/06/2018	212780					18,000	1.8		11,000		2,400		34,000			470	1,200	340	
0082	0082_MW132_8.5-9.0_180621	MW132	21/06/2018	212780					20,000	1.2		12,000		2,600		37,000			450	1,300	380	
0082	0082_MW132_6.4-6.9_191127	MW132	27/11/2019	EP1912546	<1	231	512	586	16,300	6.77	7.62	10,100	2,280			31,800		16,000	479	1,320	563	5
0082	0082_MW132_200623	MW132	23/06/2020	EP2006549	<1	207	538	591	17,200	4.69	7.70	10,200	2,340			34,800		1,190	514	1,310	543	6
0082	0082_MW132_201116	MW132	16/11/2020	EP2012670	<1	202	537	580	17,000	3.82	7.79	9,990	2,560			35,200		360	462	1,310	552	2
0082	0082_MW132_8.5-9.0_210621	MW132	21/06/2021	EP2107024	<1	166	553	628	17,800	6.37	7.64	10,800	2,280			34,300		265	493	1,450	566	
0082	0082_MW133_3.0-3.5_180310	MW133	10/03/2018	208025					16,000	0.95		9,500		2,300		31,000			460	1,000	330	
0082	0082_MW133_5.0-5.5_180310	MW133	10/03/2018	208025					18,000	-1.5		10,000		2,700		35,000			570	990	320	
0082	0082_MW133_7.0-7.5_180310	MW133	10/03/2018	208025					20,000	-2.0		11,000		2,800		39,000			490	1,200	380	
0082	0082_MW133_3.0-3.5_180621	MW133	21/06/2018	212780					17,000	0.84		9,900		2,300		32,000			410	1,000	320	
0082	0082_MW133_5.0-5.5_180621	MW133	21/06/2018	212780					19,000	-2.5		10,000		2,600		34,000			450	1,000	350	
0082	0082_MW133_7.0-7.5_180621	MW133	21/06/2018	212780					21,000	-1.2		11,000		2,800		39,000			510	1,200	380	
0082	0082_MW133_3.0-3.5_191127	MW133	27/11/2019	EP1912548	<1	332	508	666	15,800	13.5	7.61	11,700	2,660			32,800		573	521	1,430	532	15
0082	0082_MW133_200623	MW133	23/06/2020	EP2006549	<1	324	541	583	17,200	3.74	7.69	10,300	2,370			34,700		711	482	1,200	477	2
0082	0082_MW133_201116	MW133	16/11/2020	EP2012737	<1	303	555	611	17,700	4.77	7.79	10,600	2,390			29,200		112	521	1,320	586	2
0082	0082_MW133_3.0-3.5_210621	MW133	21/06/2021	EP2107024	<1	116	11.9	9.44	315	11.6	8.04	143	35			734		1,020	32	16	12	4
0082	0082_MW134_6.6-7.1_180309	MW134	9/03/2018	208025					15,000	-2.5		8,200		1,900		30,000			520	770	210	
0082	0082_MW134_8.6-9.1_180309	MW134	9/03/2018	208025					15,000	-0.90		8,600		2,000		29,000			530	810	220	
0082	0082_MW134_6.6-7.1_180622	MW134	22/06/2018	212780					15,000	0.61		8,700		1,800		31,000			490	830	220	
0082	0082_MW134_8.6-9.1_180622	MW134	22/06/2018	212780					15,000	0.74		8,600		1,900		31,000			480	790	210	

Table 4 - Water Analytical Results

					Inorganics													Metals			Organic
					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	Sulphate (filtered)	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
					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	mg/L
LOR - Limit of Reporting					1	1	0.01	0.01	1	0.01	0.01	0.5	1	1	1	1	1	5	0.1	0.1	0.1	1
PFAS NEMP 2020 Interim Marine 99%																						
PFAS NEMP 2020 Recreational Water																						
Site ID	**Field ID**	**Location Code**	**Date**	**Lab Report Number**																		
0082	0082_MW134D_191127	MW134	27/11/2019	EP1912549	<1	372	470	498	15,000	2.92	7.61	8,700	1,900			29,200		248	572	987	397	8
0082	0082_MW134_6.6_200623	MW134	23/06/2020	EP2006519	<1	328	482	512	15,500	2.99	7.46	9,060	1,830			31,600	14	4,450	550	973	390	
0082	0082_MW134_201117	MW134	17/11/2020	EP2012748	<1	303	476	491	15,300	1.54	7.57	8,550	1,860			29,300	4	15,500	572	989	368	
0082	0082_MW134_210621	MW134	21/06/2021	EP2107033	<1	312	429	514	13,800	8.94	7.57	8,920	1,630			30,500		156	598	1,050	374	4
0082	0082_MW135_8.3-8.8_180309	MW135	9/03/2018	208025																		
0082	0082_MW135_10.3-10.8_180309	MW135	9/03/2018	208025					6,400	-1.7		4,400		2,100		14,000			170	290	110	
0082	0082_MW135_8.3-8.8_180622	MW135	22/06/2018	212780					6,300	0.86		4,700		2,100		14,000			140	270	120	
0082	0082_MW135_10.3-10.8_180622	MW135	22/06/2018	212780					6,500	-4.2		4,300		2,100		14,000			150	260	100	
0082	0082_MW135_191127	MW135	27/11/2019	EP1912547	<1	663	268	314	7,040	7.88	7.76	6,000	2,690			14,600	81	157,000	168	468	226	
0082	0082_MW135_201117	MW135	17/11/2020	EP2012748	<1	623	284	278	7,720	1.07	7.94	5,310	2,580			14,800	<10	74,900	142	415	223	
0082	0082_MW135_210621	MW135	21/06/2021	EP2107028	<1	587	252	271	7,000	3.50	7.87	5,200	2,080			16,000	10	22,800	125	398	220	
0082	0082_MW137_6.1-6.6_180309	MW137	9/03/2018	208025					6,700	-1.8		3,700		940		13,000			270	390	96	
0082	0082_MW137_8.1-8.6_180309	MW137	9/03/2018	208025					8,600	-0.80		4,800		1,200		17,000			350	500	110	
0082	0082_MW137_10.1-10.6_180309	MW137	9/03/2018	208025					13,000	-1.7		7,000		1,600		23,000			480	760	180	
0082	0082_MW137_6.0-6.6_180622	MW137	22/06/2018	212780					6,400	1.1		3,900		1,000		13,000			250	390	99	
0082	0082_MW137_8.1-8.6_180622	MW137	22/06/2018	212780					8,000	3.2		5,000		1,100		18,000			310	490	120	
0082	0082_MW137_10.1-10.6_180622	MW137	22/06/2018	212780					13,000	5.6		8,100		1,600		26,000			510	860	200	
0082	0082_MW137_6.1-6.6_191127	MW137	27/11/2019	EP1912548	<1	449	212	204	6,600	2.05	7.82	3,500	828			12,300		201	249	435	133	24
0082	0082_MW137_200623	MW137	23/06/2020	EP2006549	<1	469	216	221	6,730	0.99	7.54	3,810	822			13,700		1,370	280	455	138	12
0082	0082_MW137_6.6_201116	MW137	16/11/2020	EP2012669	<1	450	222	212	7,000	2.34	7.60	3,580	760			13,800	31	1,710	272	472	155	
0082	0082_MW137_8.1-8.6_210621	MW137	21/06/2021	EP2107024	<1	373	218	213	6,780	1.14	7.66	3,770	913			13,400		233	207	422	147	29
0082	0082_MW142_180622	MW142	22/06/2018	212780					870	-1.8		460		100		2,000			96	84	40	
0082	0082_MW142_191127	MW142	27/11/2019	EP1912547	<1	399	40.4	41.0	1,050	0.70	7.74	559	135			2,390		244	126	108	58	5
0082	0082_MW142_200623	MW142	23/06/2020	EP2006519	<1	377	47.4	46.0	1,300	1.42	7.76	622	152			3,170		48	143	126	58	2
0082	0082_MW142_201117	MW142	17/11/2020	EP2012739	<1	358	47.5	47.3	1,320	0.23	7.85	641	149			2,940		156	137	133	63	<1
0082	0082_MW142_210621	MW142	21/06/2021	EP2107028	<1	303	53.7	53.9	1,600	0.22	7.61	647	121			3,870		1,120	226	156	66	3
0082	0082_MW143_180623	MW143	23/06/2018	212780					110	-1.8		220		38		770			10	9.0	28	
0082	0082_MW143_191127	MW143	27/11/2019	EP1912547	<1	394	9.33	8.78	39	3.04	8.26	146	17			504		50	11	11	38	8
0082	0082_MW143_200623	MW143	23/06/2020	EP2006519	<1	473	14.8	12.3	157	8.88	8.44	248	42			807		105	7	6	28	3
0082	0082_MW143_201117	MW143	17/11/2020	EP2012739	<1	442	14.0	12.5	156	5.61	8.39	245	38			803		154	8	8	32	<1
0082	0082_MW143_210621	MW143	21/06/2021	EP2107028	<1	407	14.5	12.6	193	7.04	8.33	251	44			852		154	6	7	31	<1
0082	0082_MW144S_180623	MW144S	23/06/2018	212780					590	0.31		650		170		2,000			24	14	23	
0082	0082_MW144_S_191128	MW144S	28/11/2019	EP1912606	<1	635	27.8	26.0	430	3.29	8.15	546	141			1,540		2,340	15	10	26	13
0082	0082_MW144S_200625	MW144S	25/06/2020	EP2006593	<1	591	31.8	25.9	599	10.2	8.17	542	149			1,790		620	16	10	28	4
0082	0082_MW144_S_201117	MW144S	17/11/2020	EP2012739	<1	556	28.5	24.6	508	7.23	8.09	512	147			1,620		2,270	18	10	26	<1
0082	0082_MW144S_210621	MW144S	21/06/2021	EP2107033	<1	647	30.8	27.8	539	5.19	8.12	592	129			1,740		300	12	8	30	2
0082	0082_MW145_180620	MW145	20/06/2018	212570					17,000	6.5		11,000		2,500		35,000			510	1,100	350	
0082	0082_MW145_191127	MW145	27/11/2019	EP1912549	<1	256	558	610	17,700	4.48	7.64	10,700	2,560			35,700		412	616	1,200	590	7
0082	0082_MW145_200625	MW145	25/06/2020	EP2006593	<1	257	567	561	18,000	0.56	7.50	9,890	2,610			35,400		16,100	540	1,100	520	4
0082	0082_MW145_201117	MW145	17/11/2020	EP2012738	<1	248	594	616	19,000	1.84	7.56	10,800	2,560			34,100		432	615	1,240	549	1
0082	0082_MW145_210621	MW145	21/06/2021	EP2107028	<1	252	567	654	18,100	7.05	7.66	11,500	2,490			34,500		995	603	1,320	570	<1
0082	0082_MW147_180621	MW147	21/06/2018	212780					13,000	-3.3		6,700		1,400		25,000			480	620	190	
0082	0082_MW147_191127	MW147	27/11/2019	EP1912549	<1	251	401	428	12,900	3.35	7.64	7,390	1,530			25,100		654	503	887	353	5
0082	0082_MW147_201117	MW147	17/11/2020	EP2012748	<1	290	413	422	13,200	1.06	7.54	7,210	1,690			24,500		2,720	528	894	338	2
0082	0082_MW147_210622	MW147	22/06/2021	EP2107183	<1	306	388	405	12,500	2.14	7.63	6,880	1,390			26,600		12,100	501	869	346	5
0082	0082_MW148S_180621	MW148S	21/06/2018	212780					16,000	-3.0		8,600		2,000		30,000			490	850	230	
0082	0082_MW148S_191127	MW148S	27/11/2019	EP1912549	<1	313	474	509	15,100	3.51	7.66	8,830	2,030			29,400		633	588	1,030	424	6
0082	0082_MW148S_200623	MW148S	23/06/2020	EP2006519	<1	386	491	490	15,500	0.10	7.44	8,630	2,210			31,500	10	4,060	514	958	396	
0082	0082_MW148S_201117	MW148S	17/11/2020	EP2012748	<1	295	484	492	15,400	0.79	7.61	8,520	2,100			29,100		2,280	578	1,000	392	1
0082	0082_MW148S_210621	MW148S	21/06/2021	EP2107033	<1	333	440	533	14,000	9.57	7.41	9,190	1,830			29,700		155	627	1,110	404	<1
0082	0082_MW151S_180621	MW151S	21/06/2018	212780					22,000	-2.2		12,000		2,800		41,000			500	1,300	390	
0082	0082_MW151S_191127	MW151S	27/11/2019	EP1912546	<1	236	619	675	19,800	4.36	7.57	11,600	2,660			39,000		3,840	555	1,530	659	4
0082	0082_MW151S_200623	MW151S	23/06/2020	EP2006518	<1	1,700	650	677	19,800	2.01	8.20	11,900	2,770			42,400		3,590	517	1,450	553	5
0082	0082_MW151_S_201116	MW151S	16/11/2020	EP2012737	<1	213	641	682	20,600	3.13	7.72	11,800	2,670			40,900		214	545	1,520	658	<1
0082	0082_MW151S_210621	MW151S	21/06/2021	EP2107024	<1	236	589	704	18,900	8.87	7.42	12,100	2,480			39,400		696	605	1,590	660	1
0082	0082_MW152S_180621	MW152S	21/06/2018	212780					19,000	-1.0		11,000		2,500		37,000			460	1,100	370	
0082	0082_MW152S_191127	MW152S	27/11/2019	EP1912546	<1	245	552	607	17,400	4.77	7.54	10,500	2,690			33,500		12,800	540	1,310	609	4
0082	0082_MW152S_200623	MW152S	23/06/2020	EP2006518	<1	243	544	587	17,300	3.85	7.64	10,400	2,450			31,900		4,950	488	1,190	498	4
0082	0082_MW152S_201116	MW152S	16/11/2020	EP2012669	<1	182	570	598	18,100	2.34	7.65	10,400	2,700			38,100	7	1,680	521	1,270	580	
0082	0082_MW152S_210622	MW152S	22/06/2021	EP2107092	<1	228	562	612	18,100	4.23	7.54	10,600	2,260			37,600		161	527	1,320	618	3
0082	0082_MW153S_180622	MW153S	22/06/2018	212780					19,000	-2.5		10,000		2,400		36,000			470	1,100	330	
0082	0082_MW153S_191128	MW153S	28/11/2019	EP1912599	<1	345	498	570	15,800	6.82	7.59	9,850	2,160			30,200		7,390	551	1,230	515	6
0082	0082_MW153S_200623	MW153S	23/06/2020	EP2006518	<1	376	515	533	16,400	1.76	7.47	9,320	2,150			34,700		75	511	1,080	530	6
0082	0082_MW153S_201116	MW153S	16/11/2020	EP2012669	<1	370	526	553	16,700	2.48	7.56	9,520	2,280			33,700		1,770	561	1,180	528	3
0082	0082_MW153S_210622	MW153S	22/06/2021	EP2107086	<1	288	534	572	17,200	3.52	7.52	9,870	2,050			35,400		1,300	539	1,240	560	3
0082	0082_MW154S_180620	MW154S	20/06/2018	212780					6,700	2.1		4,200		1,200		14,000			230	390	140	
0082	0082_MW154S_191127	MW154S	27/11/2019	EP1912548	<1	379	225	216	7,110	1.99	7.65	3,610	795			13,800		1,800	293	480	186	10
0082	0082_MW154S_200623	MW154S	23/06/2020	EP2006549	<1	330	234	245	7,390	2.30	7.65	4,060	911			14,300		2,280	359	530	271	5
0082	0082_MW154S_201116	MW154S	16/11/2020	EP2012669	<1	399	252	248	7,690	0.75	7.72	4,320	1,280			14,800	<1	892	274	492	223	
0082	0082_MW154S_210621	MW154S	21/06/2021	EP2107033	<1	432	295	287	9,350	1.51	7.53	4,950	1,110			15,700	7	1,310	319	591	266	
0082	0082_MW155S_180622	MW155S	22/06/2018	212780					6,200	1.9		3,800		830		13,000			250	370	110	
0082	0082_MW155S_191127	MW155S	27/11/2019	EP1912548	<1	508	221	214	6,800	1.46	7.58	3,650	904			13,000		5,990	297	452	143	18
0082	0082_MW155S_200623	MW155S	23/06/2020	EP2006549	<1	503	282	311	8,750	4.88	7.55	5,280	1,220			18,500		793	429	649	263	3
0082	0082_MW155S_201116	MW155S	16/11/2020	EP2012669	<1	481	276	266	8,730	1.98	7.58	4,540	993			17,100	<1	1,050	338	564	198	
0082	0082_MW155S_210621	MW155S	21/06/2021	EP2107024	<1	462	256	270	8,000	2.60	7.46	4,630	1,010			16,800		124	341	560	200	4
0082	0082_BDDBO20_180309	MW310	9/03/2018	208025					640	-0.70		740		250		2,500			25	42	36	
0082	0082_B020_180618	MW310	18/06/2018	212373					630	-0.63		730		260		2,400			26	42	37	
0082	0082_B020_191127	MW310	27/11/2019	EP1912547	<1	757	37.9	38.1	628	0.26	8.02	754	245			2,580		6,090	23	36	48	11
0082	0082_MW310_200623	MW310	23/06/2020	EP2006519	<1	701	37.7	34.9	663	3.89	8.01	673	241			2,210		146	26	38	47	8
0082	0082_MW310_201117	MW310	17/11/2020	EP2012739	<1	694	49.2	47.2	1,020	2.12	8.08	894	316			2,920		711	34	62	58	3
0082	0082_MW310_210621	MW310	21/06/2021	EP2107028	<1	660	32.9	30.3	547	4.02	7.89	565	204			1,980		720	28	37	51	4
0082	0082_B021_180618	MW311	18/06/2018	212373					31	-2.7		79		15		370			22	12	21	
0082	0082_B021_191127	MW311	27/11/2019	EP1912547	<1	304	7.39	7.15	34	1.63	8.11	100	17			410		498	23	12	26	9
0082	0082_MW311_200623	MW311	23/06/2020	EP2006519	<1	407	9.57	7.22	37	14.0	8.05	102	19			507		660	21	13	26	3
0082	0082_MW311_201117	MW311	17/11/2020	EP2012739	<1	338	8.08	7.76	33	2.02	8.19	111	19			453		452	25	13	24	2
0082	0082_MW311_210621	MW311	21/06/2021	EP2107028	<1	227	6.34	6.07	41	2.14	8.09	74	31			420		109	26	13	19	2
0082	0082_BA1_180222	MW315	22/02/2018	207359					25	-4.7	8.2	280		16		830			4.1	5.4	18	
0082	0082_BA1_180610	MW315	10/06/2018	212095					25	-2.4		280		13		800			4.2	5.2	18	
0082	0082_BA1_191127	MW315	27/11/2019	EP1912547	<1	753	17.2	14.3	51	8.99	8.38	302	33			841		582	3	5	25	12
0082	0082_MW315_200625	MW315	25/06/2020	EP2006593	<1	778	18.6	14.6	76	12.1	8.37	308	44			904		617	2	5	26	8
0082	0082_MW315_201117	MW315	17/11/2020	EP2012738	<1	702	16.8	14.7	66	6.81	8.36	300	46			941		556	7	8	25	2
0082	0082_MW315_210621	MW315	21/06/2021	EP2107033	<1	676	19.3	17.3	134	5.31	8.34	354	96			1,000		198	5	10	34	<1
0082	0082_B88_180222	MW326	22/02/2018	207359					14,000	0.13	7.1	8,500		2,900		30,000			390	780	220	
0082	0082_B88_180621	MW326	21/06/2018	212780					14,000	4.0		9,300		2,400		28,000			390	780	230	
0082	0082_B88_191128	MW326	28/11/2019	EP1912606	<1	466	414	490	12,800	8.46	7.67	8,930	2,080			24,900		144	390	895	335	8
0082	0082_MW326_200623	MW326	23/06/2020	EP2006519	<1	405	452	460	14,000	0.91	7.53	8,410	2,350			27,700		288	394	799	353	5
0082	0082_MW326_201117	MW326	17/11/2020	EP2012738	<1	429	462	482	14,200	2.14	7.55	8,680	2,520			26,400		2,400	443	887	359	2
0082	0082_MW326_210621	MW326	21/06/2021	EP2107028	<1	569	402	472	12,300	8.08	7.62	8,570	2,080			24,600		482	369	882	333	7
0082	0082_OTH101_180226	OTH101	26/02/2018	207529					20,000	1.9	7.8	12,000		3,300		41,000			440	1,400	430	
0082	0082_OTH101_A_180621	OTH101	21/06/2018	212780					21,000	14		16,000		2,700		38,000			540	1,700	520	
0082	0082_OTH101_B_180621	OTH101	21/06/2018	212780					21,000	6.7		13,000		2,600		38,000			460	1,500	440	
0082	0082_OTH101_191128	OTH101	28/11/2019	EP1912609	<1	136	634	754	20,200	8.61	7.88	13,000	2,980			40,400		1,670	536	1,760	666	5
0082	0082_OTH101_200626	OTH101	26/06/2020	EP2006685	<1	128	632	654	20,200	1.76	7.85	11,400	2,840			42,600		259	481	1,460	551	3
0082	0082_OTH101_201116	OTH101	16/11/2020	EP2012670	<1	116	644	684	20,500	3.02	7.88	11,900	3,070			44,000		442	475	1,540	646	1
0082	0082_OTH101_210621	OTH101	21/06/2021	EP2107024	<1	119	580	643	18,700	5.16	7.59	11,100	2,420			38,800		210	473	1,480	591	5
0082	0082_OTH102_180226	OTH102	26/02/2018	207529					20,000	1.8	8.1	12,000		3,300		42,000			440	1,400	440	
0082	0082_OTH102_A_180621	OTH102	21/06/2018	212780					21,000	7.0		14,000		2,700		39,000			480	1,600	450	
0082	0082_OTH102_B_180621	OTH102	21/06/2018	212780					22,000	-1.2		12,000		2,800		39,000			410	1,300	390	
0082	0082_OTH102_191128	OTH102	28/11/2019	EP1912609	<1	129	621	710	19,800	6.70	7.83	12,300	2,890			40,300		1,150	522	1,600	697	4
0082	0082_OTH102_200626	OTH102	26/06/2020	EP2006685	<1	125	627	656	20,100	2.27	7.70	11,400	2,780			36,100		244	479	1,470	618	2
0082	0082_OTH102_201116	OTH102	16/11/2020	EP2012670	<1	124	640	693	20,400	4.01	8.03	12,000	2,960			42,700		972	483	1,580	661	2
0082	0082_OTH102_210621	OTH102	21/06/2021	EP2107024	<1	133	584	649	18,800	5.24	7.72	11,200	2,460			35,000		2,190	476	1,490	594	3
0082	0082_OTH103_180226	OTH103	26/02/2018	207529					20,000	0.36	7.9	12,000		3,300		43,000			440	1,400	420	
0082	0082_OTH103_A_180621	OTH103	21/06/2018	212780					22,000	6.0		14,000		2,800		39,000			480	1,500	450	

Table 4 - Water Analytical Results

					Inorganics													Metals			Organic
					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	Sulphate (filtered)	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
					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	mg/L
LOR - Limit of Reporting					1	1	0.01	0.01	1	0.01	0.01	0.5	1	1	1	1	1	5	0.1	0.1	0.1	1
PFAS NEMP 2020 Interim Marine 99%																						
PFAS NEMP 2020 Recreational Water																						
Site ID	**Field ID**	**Location Code**	**Date**	**Lab Report Number**																		
0082	**0082_OTH103_B_180621**	**OTH103**	**21/06/2018**	**212780**					21,000	5.1		13,000		2,700		40,000			450	1,500	430	
0082	**0082_OTH103_191128**	**OTH103**	**28/11/2019**	**EP1912609**	<1	126	631	747	20,200	8.45	7.93	12,900	2,810			39,600		3,630	528	1,740	650	3
0082	**0082_OTH103_200626**	**OTH103**	**26/06/2020**	**EP2006685**	<1	129	626	643	20,000	1.32	7.80	11,200	2,860			42,000		764	470	1,440	544	2
0082	**0082_OTH103_201116**	**OTH103**	**16/11/2020**	**EP2012670**	<1	122	640	692	20,400	3.95	8.05	12,000	2,960			43,800		1,070	483	1,570	657	1
0082	**0082_OTH103_210621**	**OTH103**	**21/06/2021**	**EP2107024**	<1	129	595	611	19,000	1.32	7.94	10,500	2,730			37,000		35	457	1,420	581	2
0082	**0082_OTH104_180226**	**OTH104**	**26/02/2018**	**207529**					20,000	4.6	8.0	13,000		3,200		41,000			450	1,500	440	
0082	**0082_OTH104_A_180621**	**OTH104**	**21/06/2018**	**212780**					22,000	13		16,000		2,800		40,000			540	1,800	520	
0082	**0082_OTH104_B_180621**	**OTH104**	**21/06/2018**	**212780**					22,000	0.90		12,000		2,800		40,000			430	1,400	410	
0082	**0082_OTH104_191128**	**OTH104**	**28/11/2019**	**EP1912609**	<1	170	634	765	20,200	9.36	7.93	13,200	2,920			41,200		82	543	1,780	672	4
0082	**0082_OTH104_200626**	**OTH104**	**26/06/2020**	**EP2006685**	<1	135	641	648	20,500	0.53	7.85	11,300	2,900			41,600		164	470	1,450	544	2
0082	**0082_OTH104_201116**	**OTH104**	**16/11/2020**	**EP2012670**	<1	127	646	731	20,500	6.22	7.92	12,700	3,110			43,700		1,070	504	1,650	696	<1
0082	**0082_OTH104_210621**	**OTH104**	**21/06/2021**	**EP2107024**	<1	135	583	696	18,700	8.78	7.95	12,000	2,550			39,400		34	514	1,600	638	2
0082	**0082_OTH105_180226**	**OTH105**	**26/02/2018**	**207529**					20,000	2.6	7.8	12,000		3,300		41,000			450	1,400	430	
0082	**0082_OTH105_A_180621**	**OTH105**	**21/06/2018**	**212780**					22,000	0.20		12,000		2,800		41,000			420	1,400	400	
0082	**0082_OTH105_B_180621**	**OTH105**	**21/06/2018**	**212780**					22,000	-1.0		12,000		2,800		39,000			410	1,300	390	
0082	**0082_OTH105_191128**	**OTH105**	**28/11/2019**	**EP1912609**	<1	129	613	706	19,600	7.07	7.86	12,200	2,750			41,000		1,860	517	1,600	694	3
0082	**0082_OTH105_200626**	**OTH105**	**26/06/2020**	**EP2006685**	<1	132	635	678	20,300	3.29	7.82	11,800	2,850			42,400		126	499	1,520	570	2
0082	**0082_OTH105_201116**	**OTH105**	**16/11/2020**	**EP2012670**	<1	121	642	710	20,400	4.98	7.97	12,300	3,100			43,700		437	498	1,610	679	1
0082	**0082_OTH105_210621**	**OTH105**	**21/06/2021**	**EP2107024**	<1	134	597	690	19,200	7.22	7.88	11,900	2,520			40,000		39	505	1,590	626	1
0082	**0082_OTH106_180226**	**OTH106**	**26/02/2018**	**207529**					20,000	4.1	8.0	13,000		3,300		41,000			450	1,500	440	
0082	**0082_OTH106_A_180621**	**OTH106**	**21/06/2018**	**212780**					21,000	0.61		12,000		2,700		40,000			420	1,400	400	
0082	**0082_OTH106_B_180621**	**OTH106**	**21/06/2018**	**212780**					22,000	-3.2		11,000		2,800		40,000			400	1,300	380	
0082	**0082_OTH106_191128**	**OTH106**	**28/11/2019**	**EP1912609**	<1	115	601	705	19,200	7.91	7.93	12,200	2,760			39,700		376	515	1,590	684	3
0082	**0082_OTH106_200626**	**OTH106**	**26/06/2020**	**EP2006685**	<1	214	639	655	20,400	1.24	7.86	11,400	2,840			40,600		604	480	1,470	553	2
0082	**0082_OTH106_201116**	**OTH106**	**16/11/2020**	**EP2012670**	<1	120	647	698	20,600	3.79	7.94	12,100	3,060			43,700		426	485	1,590	660	1
0082	**0082_OTH106_210621**	**OTH106**	**21/06/2021**	**EP2107024**	<1	162	596	713	19,200	8.92	7.63	12,300	2,480			40,000		35	530	1,640	658	7
0082	**0082_SW161_180225**	**SW161**	**25/02/2018**	**207529**					76,000	1.7	7.4	45,000		10,000		150,000			1,000	4,900	1,500	
0082	**0082_SW161_180623**	**SW161**	**23/06/2018**	**212780**					13,000	2.8		8,000		2,400		27,000			540	890	270	
0082	**0082_SW161_200526**	**SW161**	**26/05/2020**	**EP2005403**	<1	124	636	705	20,200	5.16	7.74	12,200	3,040			43,900		16	605	1,540	672	13
0082	**0082_SW161_200623**	**SW161**	**23/06/2020**	**EP2006451**	<1	131	1,340	1,730	42,300	12.5	8.49	29,300	7,120			98,500		24	1,930	3,890	1,440	30
0082	**0082_SW161_210303**	**SW161**	**3/03/2021**	**EP2102193**	<1	78	461	500	14,400	4.07	7.55	8,580	2,560			26,900		15	647	1,010	452	14
0082	**0082_SW161_210621**	**SW161**	**21/06/2021**	**EP2107025**	<1	80	103	107	3,210	1.98	7.79	1,840	530			6,810		<5	123	228	94	9
0082	**0082_SW162_180225**	**SW162**	**25/02/2018**	**207529**					54,000	2.4	7.5	32,000		6,800		110,000			810	3,600	1,100	
0082	**0082_SW162_180623**	**SW162**	**23/06/2018**	**212780**					13,000	6.0		8,500		2,400		27,000			550	930	280	
0082	**0082_SW162_200526**	**SW162**	**26/05/2020**	**EP2005403**	<1	124	623	687	19,800	4.87	7.73	11,900	2,980			43,500		<5	587	1,500	644	13
0082	**0082_SW162_200623**	**SW162**	**23/06/2020**	**EP2006451**	<1	119	1,300	1,650	41,000	11.9	8.05	28,000	6,650			93,400		46	1,800	3,710	1,390	27
0082	**0082_SW162_210303**	**SW162**	**3/03/2021**	**EP2102193**	<1	125	630	701	19,800	5.32	7.66	12,000	3,330			39,200		21	719	1,530	680	14
0082	**0082_SW162_210621**	**SW162**	**21/06/2021**	**EP2107025**	<1	89	104	106	3,260	0.46	7.66	1,810	519			6,670		<5	119	224	94	9
0082	**0082_SW163_180223**	**SW163**	**23/02/2018**	**207359**					75,000	3.5	7.2	46,000		11,000		140,000			880	5,300	1,000	
0082	**0082_SW163_180623**	**SW163**	**23/06/2018**	**212780**					13,000	5.7		8,400		2,500		28,000			540	930	270	
0082	**0082_SW163_200526**	**SW163**	**26/05/2020**	**EP2005403**	<1	125	629	722	20,000	6.87	7.70	12,500	3,000			44,100		34	616	1,580	683	12
0082	**0082_SW163_200623**	**SW163**	**23/06/2020**	**EP2006451**	<1	125	1,260	1,530	40,000	9.54	8.22	25,900	6,220			87,200		11	1,700	3,420	1,300	22
0082	**0082_SW163_210303**	**SW163**	**3/03/2021**	**EP2102193**	<1	132	625	731	19,600	7.84	7.59	12,500	3,320			38,200		67	763	1,590	718	18
0082	**0082_SW163_210621**	**SW163**	**21/06/2021**	**EP2107025**	<1	87	111	111	3,460	0.05	7.76	1,900	546			6,890		<5	123	235	97	9
0082	**0082_SW164_180312**	**SW164**	**12/03/2018**	**208025**					23	-4.4		13		7		120			13	2.4	2.6	
0082	**0082_SW164_180619**	**SW164**	**19/06/2018**	**212570**					8	1.4		5.2			<1	63			14	1.2	0.6	
0082	**0082_SW164_200525**	**SW164**	**25/05/2020**	**EP2005398**	<1	32	0.98	1.10	9		7.47	6	4			60		<5	13	2	1	4
0082	**0082_SW181_180608**	**SW181**	**8/06/2018**	**212095**					26,000	-0.39		15,000		3,500		52,000			530	1,600	510	
0082	**0082_SW181_191128**	**SW181**	**28/11/2019**	**EP1912602**	<1	192	2,280	2,930	74,300	12.6	8.67	51,700	8,460			148,000		37	1,640	6,600	2,340	22
0082	**0082_SW181_200526**	**SW181**	**26/05/2020**	**EP2005403**	<1	123	644	713	20,600	5.03	7.66	12,400	2,930			46,900		<5	505	1,590	680	12
0082	**0082_SW181_200623**	**SW181**	**23/06/2020**	**EP2006521**	<1	191	850	1,030	27,000	9.83	7.98	18,300	4,040			63,600		7	707	2,230	784	12
0082	**0082_SW181_201116**	**SW181**	**16/11/2020**	**EP2012672**	<1	147	2,000	2,400	64,600	9.07	8.49	41,900	8,500			140,000		66	1,580	5,450	2,020	16
0082	**0082_SW181_210303**	**SW181**	**3/03/2021**	**EP2102193**	<1	103	789	939	25,000	8.67	8.02	16,300	3,930			51,000		<5	737	2,040	986	12
0082	**0082_SW181_210621**	**SW181**	**21/06/2021**	**EP2107025**	<1	172	605	723	19,500	8.87	7.47	12,600	2,470			43,600		33	519	1,600	668	13

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

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Table 5 - Sediment Analytical 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)
				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
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	0.0005	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
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	**Location Code**	**Date**	**Lab Report Number**																												
0082_SD181_0.00-0.10_191128	SD181	28/11/2019	EP1912601	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD181_200526	SD181	26/05/2020	EP2005402	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD181_200623	SD181	23/06/2020	EP2006522	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD181_201116	SD181	16/11/2020	EP2012673	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD181_210303	SD181	3/03/2021	EP2102192	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD181_210621	SD181	21/06/2021	EP2107026	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS161_0.0_180225	SS161	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS161_0.4_180225	SS161	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS161_0.0_180623	SS161	23/06/2018	212780	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS161_0.4_180623	SS161	23/06/2018	212780	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS161_191127	SS161	27/11/2019	EP1912545	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD161_200526	SS161	26/05/2020	EP2005402	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD161_0.00-0.10_200623	SS161	23/06/2020	EP2006517	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD161_0.00-0.10_201116	SS161	16/11/2020	EP2012674	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD161_210303	SS161	3/03/2021	EP2102200	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD161_210621	SS161	21/06/2021	EP2107026	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS162_0.0_180225	SS162	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS162_0.5_180225	SS162	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS162_0.0_180623	SS162	23/06/2018	212780	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS162_0.4_180623	SS162	23/06/2018	212780	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS162_191127	SS162	27/11/2019	EP1912545	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD162_200526	SS162	26/05/2020	EP2005402	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_-SD162_0.00-0.10_200623	SS162	23/06/2020	EP2006517	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD162_201116	SS162	16/11/2020	EP2012674	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD162_210303	SS162	3/03/2021	EP2102200	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD162_210621	SS162	21/06/2021	EP2107026	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS163_0.0_180223	SD163	23/02/2018	207359	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS163_0.4_180223	SD163	23/02/2018	207359	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS163_0.0_180623	SD163	23/06/2018	212780	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS163_0.4_180623	SD163	23/06/2018	212780	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS163_191127	SS163	27/11/2019	EP1912545	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD163_200526	SD163	26/05/2020	EP2005402	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD163_0.00-0.10_200623	SS163	23/06/2020	EP2006517	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD163_201116	SD163	16/11/2020	EP2012674	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD163_210303	SD163	3/03/2021	EP2102200	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD163_210621	SD163	21/06/2021	EP2107026	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS164_0.0_180214	SS164	14/02/2018	206929	<0.0001	<0.0001	0.0003	<0.0001	0.0028	<0.0002	<0.0002	0.0002	<0.0002	0.0001	0.0002	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	0.0002	0.0009	0.0005	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS164_0.4_180214	SS164	14/02/2018	206929	<0.0001	0.0001	0.0008	<0.0001	0.0062	0.0006	<0.0002	0.0008	0.0007	0.0006	0.0006	<0.0005	<0.0005	0.0001	<0.005	<0.0005	<0.0005	<0.0001	0.0011	0.0024	0.0007	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS164_0.0_180608	SS164	8/06/2018	211877	<0.0001	<0.0001	0.0002	<0.0001	0.0026	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	0.0003	0.0005	0.0002	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS164_0.5_180608	SS164	8/06/2018	211877	<0.0001	<0.0001	<0.0001	<0.0001	0.0011	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	0.0004	0.0004	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS164_191127	SS164	27/11/2019	EP1912552	<0.0002	<0.0002	<0.0002	<0.0002	0.0028	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD164_200525	SS164	25/05/2020	EP2005401	<0.0002	<0.0002	<0.0002	<0.0002	0.0046	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD164_200623	SS164	23/06/2020	EP2006522	<0.0002	<0.0002	<0.0002	<0.0002	0.0010	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD164_201116	SS164	16/11/2020	EP2012671	<0.0002	<0.0002	0.0002	<0.0002	0.0345	<0.0002	<0.001	0.0008	0.0007	0.0003	0.0004	<0.0002	<0.0002	0.0004	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	0.0026	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD164_210303	SS164	3/03/2021	EP2102200	<0.0002	<0.0002	0.0007	<0.0002	0.0099	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0005	0.0002	0.0003	<0.0005	0.0010	0.0015	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD164_210621	SS164	21/06/2021	EP2107034	<0.0002	<0.0002	<0.0002	<0.0002	0.0034	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0005	<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
0082_SS165_0.0_180214	SS165	14/02/2018	206929	<0.0001	<0.0001	<0.0001	<0.0001	0.0007	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS165_0.4_180214	SS165	14/02/2018	206929	<0.0001	<0.0001	0.0002	<0.0001	0.0022	0.001	<0.0002	<0.0001	<0.0002	0.0001	0.0003	<0.0005	<0.0005	0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	0.0004	0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS165_191127	SS165	27/11/2019	EP1912550	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS165_200528	SS165	28/05/2020	EP2005659	<0.0002	<0.0002	0.0005	<0.0002	0.0023	0.0008	<0.001	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	0.0008	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS165_200623	SS165	23/06/2020	EP2006522	<0.0002	<0.0002	<0.0002	<0.0002	0.0058	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS165_201116	SS165	16/11/2020	EP2012671	<0.0002	<0.0002	0.0008	<0.0002	0.0083	0.0015	<0.001	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	0.0002	<0.0002	<0.0005	<0.0002	0.0002	<0.0005	<0.0005	0.0007	<0.0005	0.0002	<0.0005	0.0005	<0.0005	<0.0005	0.0004	<0.0005
0082_SS165_210303	SS165	3/03/2021	EP2102192	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD165_210621	SS165	21/06/2021	EP2107034	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS167_0.0_180214	SS167	14/02/2018	206929	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	0.0005	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS167_0.4_180214	SS167	14/02/2018	206929	<0.0001	<0.0001	<0.0001	<0.0001	0.0013	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS167_0.0_180608	SS167	8/06/2018	211877	<0.0001	<0.0001	<0.0001	<0.0001	0.0008	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS167_0.5_180608	SS167	8/06/2018	211877	<0.0001	<0.0001	<0.0001	<0.0001	0.0067	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS167_191127	SS167	27/11/2019	EP1912552	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS167_200528	SS167	28/05/2020	EP2005659	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS167_200623	SS167	23/06/2020	EP2006522	<0.0002	<0.0002	<0.0002	<0.0002	0.0022	0.0014	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS167_201116	SS167	16/11/2020	EP2012671	<0.0002	<0.0002	<0.0002	<0.0002	0.0024	0.0011	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD167_210303	SS167	3/03/2021	EP2102200	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD167_210621	SS167	21/06/2021	EP2107034	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS169_0.0_180225	SS169	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	0.0007	0.0003	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS169_0.3_180225	SS169	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	0.0032	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS169_191127	SS169	27/11/2019	EP1912552	<0.0002	<0.0002	<0.0002	<0.0002	0.0010	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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS169_200528	SS169	28/05/2020	EP2005659	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS169_200623	SS169	23/06/2020	EP2006522	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS169_201116	SS169	16/11/2020	EP2012671	<0.0002	<0.0002	<0.0002	<0.0002	0.0016	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD169_210303	SS169	3/03/2021	EP2102200	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SD169_210621	SS169	21/06/2021	EP2107034	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS171_0.0_180225	SS171	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS171_0.3_180225	SS171	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS171_191127	SS171	27/11/2019	EP1912550	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS171_200528	SS171	28/05/2020	EP2005560	<0.0002	<0.0002	<0.0002	<0.0002	0.0016	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS171_200623	SS171	23/06/2020	EP2006522	<0.0002	<0.0002	<0.0002	<0.0002	0.0010	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS171_201116	SS171	16/11/2020	EP2012673	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS171_210303	SS171	3/03/2021	EP2102200	<0.0002	<0.0002	<0.0002	<0.0002	0.0026	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS171_210621	SS171	21/06/2021	EP2107034	<0.0002	<0.0002	<0.0002	<0.0002	0.0056	0.0034	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0005	0.0002	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS173_0.0_180225	SS173	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	0.0007	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS173_0.3_180225	SS173	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	0.0003	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS173_0.0_180608	SS173	8/06/2018	211877	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS173_191127	SS173	27/11/2019	EP1912550	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS173_200528	SS173	28/05/2020	EP2005560	<0.0002	<0.0002	<0.0002	<0.0002	0.0008	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS173_200623	SS173	23/06/2020	EP2006522	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS173_201116	SS173	16/11/2020	EP2012673	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS173_210303	SS173	3/03/2021	EP2102200	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS173_210621	SS173	21/06/2021	EP2107026	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS179_0.0_180225	SS179	25/02/2018	207529	<0.0001	<0.0001	<0.0001	<0.0002	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005
0082_SS179_191127	SS179	27/11/2019	EP1912550	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS179_200623	SS179	23/06/2020	EP2006522	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS179_201116	SS179	16/11/2020	EP2012673	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS179_210303	SS179	3/03/2021	EP2102192	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
0082_SS179_210621	SS179	21/06/2021	EP2107026	<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	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005

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

Table 5 - Sediment Analytical Results

	PFAS													Organic
	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	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%
LOR - Limit of Reporting	0.0002	0.0001	0.0001	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													
PFAS NEMP 2020 Ecological indirect exposure													
PFAS NEMP 2020 Industrial/ commercial (HIL D)		**20**											
Field ID	**Location Code**	**Date**	**Lab Report Number**											
0082_SD181_0.00-0.10_191128	**SS181**	**28/11/2019**	**EP1912601**	<0.0002	<0.0002	<0.0002	3.9	51.4	16.4	5.7	0.2	0.9	23.2	15,000	8.4	4.7
0082_SD181_200526	**SS181**	**26/05/2020**	**EP2005402**	<0.0002	<0.0002	<0.0002	1.0	13.2	12.7	1.6	<0.1	0.1	14.5	2,510	9.2	0.8
0082_SD181_200623	**SS181**	**23/06/2020**	**EP2006522**	<0.0002	<0.0002	<0.0002	<0.1	39.0	10.0	0.4	0.2	<0.1	10.6	9,020	8.7	2.2
0082_SD181_201116	**SS181**	**16/11/2020**	**EP2012673**	<0.0002	<0.0002	<0.0002	71.4	18.6	9.1	17.3	2.6	72.2	101	18	8.7	1.8
0082_SD181_210303	**SS181**	**3/03/2021**	**EP2102192**	<0.0002	<0.0002	<0.0002	0.6	21.0	17.9	3.4	<0.1	0.1	21.5	1,350	9.0	1.3
0082_SD181_210621	**SS181**	**21/06/2021**	**EP2107026**	<0.0002	<0.0002	<0.0002	1.2	28.1	12.5	1.8	<0.1	0.2	14.6	3,480	8.8	4.2
0082_SS161_0.0_180225	**SS161**	**25/02/2018**	**207529**													
0082_SS161_0.4_180225	**SS161**	**25/02/2018**	**207529**													
0082_SS161_0.0_180623	**SS161**	**23/06/2018**	**212780**		<0.0001	<0.0001		29								
0082_SS161_0.4_180623	**SS161**	**23/06/2018**	**212780**		<0.0001	<0.0001		31								
0082_SS161_191127	**SS161**	**27/11/2019**	**EP1912545**	<0.0002	<0.0002	<0.0002	2.5	30.2	25.5	8.4	0.2	0.9	35.0	28,000	8.6	8.3
0082_SD161_200526	**SS161**	**26/05/2020**	**EP2005402**	<0.0002	<0.0002	<0.0002	1.4	35.6	17.6	5.9	0.3	0.3	24.2	4,030	8.8	1.8
0082_SD161_0.00-0.10_200623	**SS161**	**23/06/2020**	**EP2006517**	<0.0002	<0.0002	<0.0002	2.5	26.8	27.6	10.3	0.3	1.0	39.2	8,990	8.8	2.4
0082_SD161_0.00-0.10_201116	**SS161**	**16/11/2020**	**EP2012674**	<0.0002	<0.0002	<0.0002	1.7	18.6	30.6	7.6	0.3	0.7	39.2	25,800	8.8	5.5
0082_SD161_210303	**SS161**	**3/03/2021**	**EP2102200**	<0.0002	<0.0002	<0.0002	1.1	32.0	22.5	5.5	0.4	0.3	28.7	8,760	8.7	1.9
0082_SD161_210621	**SS161**	**21/06/2021**	**EP2107026**	<0.0002	<0.0002	<0.0002	1.9	41.5	14.0	4.4	0.2	0.4	19.0	993	8.8	5.6
0082_SS162_0.0_180225	**SS162**	**25/02/2018**	**207529**													
0082_SS162_0.5_180225	**SS162**	**25/02/2018**	**207529**													
0082_SS162_0.0_180623	**SS162**	**23/06/2018**	**212780**		<0.0001	<0.0001		28	23	4.5	0.7	0.8	29			
0082_SS162_0.4_180623	**SS162**	**23/06/2018**	**212780**		<0.0001	<0.0001		22								
0082_SS162_191127	**SS162**	**27/11/2019**	**EP1912545**	<0.0002	<0.0002	<0.0002	1.8	28.5	22.4	6.6	0.2	0.5	29.6	17,300	8.8	5.2
0082_SD162_200526	**SS162**	**26/05/2020**	**EP2005402**	<0.0002	<0.0002	<0.0002	1.0	30.9	18.5	5.0	0.3	0.2	24.1	4,150	8.9	4.0
0082_ SD162_0.00-0.10_200623	**SS162**	**23/06/2020**	**EP2006517**	<0.0002	<0.0002	<0.0002	2.5	29.6	23.3	10.5	0.3	0.9	35.1	8,850	8.8	2.2
0082_SD162_201116	**SS162**	**16/11/2020**	**EP2012674**	<0.0002	<0.0002	<0.0002	2.9	20.6	18.6	7.6	0.4	0.8	27.4	18,100	8.9	1.1
0082_SD162_210303	**SS162**	**3/03/2021**	**EP2102200**	<0.0002	<0.0002	<0.0002	1.2	25.4	22.7	7.1	0.3	0.4	30.5	11,100	8.7	1.2
0082_SD162_210621	**SS162**	**21/06/2021**	**EP2107026**	<0.0002	<0.0002	<0.0002	1.6	33.5	14.7	3.3	0.1	0.3	18.4	786	9.3	4.1
0082_SS163_0.0_180223	**SD163**	**23/02/2018**	**207359**					28								
0082_SS163_0.4_180223	**SD163**	**23/02/2018**	**207359**						29	10	0.7	1.3	41			
0082_SS163_0.0_180623	**SD163**	**23/06/2018**	**212780**		<0.0001	<0.0001		28								
0082_SS163_0.4_180623	**SD163**	**23/06/2018**	**212780**		<0.0001	<0.0001		29								
0082_SS163_191127	**SS163**	**27/11/2019**	**EP1912545**	<0.0002	<0.0002	<0.0002	5.0	35.7	27.2	9.0	0.4	1.9	38.5	35,500	8.6	4.3
0082_SD163_200526	**SD163**	**26/05/2020**	**EP2005402**	<0.0002	<0.0002	<0.0002	2.0	32.4	31.4	9.4	0.5	0.8	42.2	10,900	8.7	2.8
0082_SD163_0.00-0.10_200623	**SS163**	**23/06/2020**	**EP2006517**	<0.0002	<0.0002	<0.0002	2.4	24.8	26.5	8.4	0.4	0.8	36.2	7,360	8.7	2.3
0082_SD163_201116	**SD163**	**16/11/2020**	**EP2012674**	<0.0002	<0.0002	<0.0002	5.1	35.9	21.7	10.4	0.6	1.8	34.6	32,400	8.4	5.7
0082_SD163_210303	**SD163**	**3/03/2021**	**EP2102200**	<0.0002	<0.0002	<0.0002	2.4	32.7	29.1	10.6	0.5	1.0	41.2	9,910	8.7	3.0
0082_SD163_210621	**SD163**	**21/06/2021**	**EP2107026**	<0.0002	<0.0002	<0.0002	1.0	34.4	13.6	2.4	<0.1	0.2	16.2	715	9.4	4.0
0082_SS164_0.0_180214	**SS164**	**14/02/2018**	**206929**					6.1								
0082_SS164_0.4_180214	**SS164**	**14/02/2018**	**206929**													
0082_SS164_0.0_180608	**SS164**	**8/06/2018**	**211877**					24	17	0.9	<0.13	<0.22	18			
0082_SS164_0.5_180608	**SS164**	**8/06/2018**	**211877**					9.3								
0082_SS164_191127	**SS164**	**27/11/2019**	**EP1912552**	0.0028	0.0028	0.0028	<0.1	0.2	3.0	0.3	0.2	<0.1	3.4	35	8.0	0.9
0082_SD164_200525	**SS164**	**25/05/2020**	**EP2005401**	0.0046	0.0046	0.0046	0.2	14.4	11.3	0.7	0.2	<0.1	12.3	56,700	9.1	0.9
0082_SD164_200623	**SS164**	**23/06/2020**	**EP2006522**	0.0010	0.0010	0.0010	0.8	13.6	11.8	0.8	0.2	0.1	12.9	54	8.9	1.4
0082_SD164_201116	**SS164**	**16/11/2020**	**EP2012671**	0.0395	0.0347	0.0399	2.7	17.3	8.5	0.6	0.5	0.3	9.9	81	9.2	0.7
0082_SD164_210303	**SS164**	**3/03/2021**	**EP2102200**	0.0131	0.0106	0.0140	0.5	16.2	17.6	1.5	0.2	0.1	19.4	79	8.6	4.2
0082_SD164_210621	**SS164**	**21/06/2021**	**EP2107034**	0.0034	0.0034	0.0037	0.7	4.8	3.7	0.5	0.2	<0.1	4.4	38	8.8	1.5
0082_SS165_0.0_180214	**SS165**	**14/02/2018**	**206929**					0.12	2.4	0.6	0.2	1.2	4			
0082_SS165_0.4_180214	**SS165**	**14/02/2018**	**206929**													
0082_SS165_191127	**SS165**	**27/11/2019**	**EP1912550**	<0.0002	<0.0002	<0.0002	<0.1	18.0	1.2	0.5	0.2	<0.1	1.9	8	8.2	0.5
0082_SS165_200528	**SS165**	**28/05/2020**	**EP2005659**	0.0039	0.0028	0.0047	2.5	7.9	7.4	1.4	0.9	0.2	9.9	97	8.3	3.0
0082_SS165_200623	**SS165**	**23/06/2020**	**EP2006522**	0.0058	0.0058	0.0058	0.3	2.5	6.6	1.1	0.3	<0.1	8.0	111	7.6	3.7
0082_SS165_201116	**SS165**	**16/11/2020**	**EP2012671**	0.0103	0.0091	0.0133	1.6	28.4	10.1	1.6	0.7	0.2	12.6	195	7.3	5.0
0082_SS165_210303	**SS165**	**3/03/2021**	**EP2102192**	0.0012	0.0012	0.0012	0.7	8.3	9.0	0.9	0.5	<0.1	10.4	66	8.5	1.9
0082_SD165_210621	**SS165**	**21/06/2021**	**EP2107034**	0.0005	0.0005	0.0005	0.7	4.5	2.0	0.5	0.1	<0.1	2.6	14	7.6	0.5
0082_SS167_0.0_180214	**SS167**	**14/02/2018**	**206929**					0.13								
0082_SS167_0.4_180214	**SS167**	**14/02/2018**	**206929**						3.5	<0.41	0.1	1.3	5			
0082_SS167_0.0_180608	**SS167**	**8/06/2018**	**211877**					5.6								
0082_SS167_0.5_180608	**SS167**	**8/06/2018**	**211877**					9.8								
0082_SS167_191127	**SS167**	**27/11/2019**	**EP1912552**	0.0005	0.0005	0.0005	<0.1	0.2	2.2	0.2	0.1	<0.1	2.6	30	8.1	0.8
0082_SS167_200528	**SS167**	**28/05/2020**	**EP2005659**	<0.0002	<0.0002	<0.0002	1.3	3.3	2.8	0.5	0.3	<0.1	3.6	56	8.3	1.0
0082_SS167_200623	**SS167**	**23/06/2020**	**EP2006522**	0.0022	0.0022	0.0038	<0.1	0.8	5.0	0.4	0.2	<0.1	5.6	46	8.8	1.2
0082_SS167_201116	**SS167**	**16/11/2020**	**EP2012671**	0.0024	0.0024	0.0035	2.5	19.4	5.4	0.4	0.3	0.2	6.2	61	8.7	0.8
0082_SD167_210303	**SS167**	**3/03/2021**	**EP2102200**	<0.0002	<0.0002	<0.0002	3.2	8.8	1.9	0.4	0.2	<0.1	2.6	24	8.4	<0.5
0082_SD167_210621	**SS167**	**21/06/2021**	**EP2107034**	<0.0002	<0.0002	<0.0002	0.9	13.0	2.4	0.3	0.2	<0.1	2.9	33	8.0	1.3
0082_SS169_0.0_180225	**SS169**	**25/02/2018**	**207529**													
0082_SS169_0.3_180225	**SS169**	**25/02/2018**	**207529**													
0082_SS169_191127	**SS169**	**27/11/2019**	**EP1912552**	0.0010	0.0010	0.0012	<0.1	17.7	3.4	0.2	<0.1	<0.1	3.7	35	8.7	0.8
0082_SS169_200528	**SS169**	**28/05/2020**	**EP2005659**	0.0006	0.0006	0.0006	0.5	3.2	4.7	0.3	0.1	<0.1	5.2	27	9.0	0.6
0082_SS169_200623	**SS169**	**23/06/2020**	**EP2006522**	<0.0002	<0.0002	<0.0002	<0.1	0.7	5.7	0.5	0.4	<0.1	6.6	48	9.1	0.8
0082_SS169_201116	**SS169**	**16/11/2020**	**EP2012671**	0.0016	0.0016	0.0016	4.3	18.6	6.6	0.7	0.3	0.3	8.0	97	9.0	1.5
0082_SD169_210303	**SS169**	**3/03/2021**	**EP2102200**	0.0004	0.0004	0.0004	1.2	4.6	3.7	0.3	0.1	<0.1	4.2	41	9.1	<0.5
0082_SD169_210621	**SS169**	**21/06/2021**	**EP2107034**	<0.0002	<0.0002	<0.0002	0.3	2.0	6.4	0.3	0.1	<0.1	6.8	41	9.2	1.3
0082_SS171_0.0_180225	**SS171**	**25/02/2018**	**207529**													
0082_SS171_0.3_180225	**SS171**	**25/02/2018**	**207529**													
0082_SS171_191127	**SS171**	**27/11/2019**	**EP1912550**	0.0004	0.0004	0.0004	<0.1	0.4	2.6	0.5	0.2	<0.1	3.3	36	8.9	0.7
0082_SS171_200528	**SS171**	**28/05/2020**	**EP2005560**	0.0016	0.0016	0.0016	1.2	25.9	14.1	2.0	0.5	0.2	16.7	51	9.0	2.1
0082_SS171_200623	**SS171**	**23/06/2020**	**EP2006522**	0.0010	0.0010	0.0010	<0.1	0.5	9.0	0.5	0.2	<0.1	9.7	71	9.2	1.1
0082_SS171_201116	**SS171**	**16/11/2020**	**EP2012673**	<0.0002	<0.0002	<0.0002	3.2	0.3	9.8	0.7	0.2	0.4	11.0	119	9.1	0.8
0082_SS171_210303	**SS171**	**3/03/2021**	**EP2102200**	0.0026	0.0026	0.0026	1.6	7.7	3.1	0.6	0.3	<0.1	4.1	37	8.6	0.9
0082_SS171_210621	**SS171**	**21/06/2021**	**EP2107034**	0.0056	0.0056	0.0098	1.1	16.2	4.0	0.3	0.2	<0.1	4.5	44	8.8	1.2
0082_SS173_0.0_180225	**SS173**	**25/02/2018**	**207529**													
0082_SS173_0.3_180225	**SS173**	**25/02/2018**	**207529**													
0082_SS173_0.0_180608	**SS173**	**8/06/2018**	**211877**					8.2								
0082_SS173_191127	**SS173**	**27/11/2019**	**EP1912550**	0.0003	0.0003	0.0003	<0.1	0.2	9.8	0.4	0.2	<0.1	10.4	55	9.0	1.1
0082_SS173_200528	**SS173**	**28/05/2020**	**EP2005560**	0.0008	0.0008	0.0008	0.2	0.6	12.7	0.8	<0.1	<0.1	13.6	385	9.0	<0.5
0082_SS173_200623	**SS173**	**23/06/2020**	**EP2006522**	<0.0002	<0.0002	<0.0002	<0.1	1.6	10.3	0.6	0.3	<0.1	11.1	61	8.9	1.0
0082_SS173_201116	**SS173**	**16/11/2020**	**EP2012673**	0.0002	0.0002	0.0002	3.4	26.5	14.0	3.2	0.5	0.6	18.3	108	9.0	1.9
0082_SS173_210303	**SS173**	**3/03/2021**	**EP2102200**	<0.0002	<0.0002	<0.0002	0.5	7.8	12.8	0.8	0.6	<0.1	14.2	71	8.9	1.0
0082_SS173_210621	**SS173**	**21/06/2021**	**EP2107026**	<0.0002	<0.0002	<0.0002	0.6	4.3	6.9	0.4	0.4	<0.1	7.8	60	8.9	1.6
0082_SS179_0.0_180225	**SS179**	**25/02/2018**	**207529**													
0082_SS179_191127	**SS179**	**27/11/2019**	**EP1912550**	<0.0002	<0.0002	<0.0002		18.5						752	8.9	0.7
0082_SS179_200623	**SS179**	**23/06/2020**	**EP2006522**	<0.0002	<0.0002	<0.0002	<0.1	2.0	3.9	0.8	0.1	<0.1	4.9	350	9.2	1.1
0082_SS179_201116	**SS179**	**16/11/2020**	**EP2012673**	<0.0002	<0.0002	<0.0002	26.6	0.3	6.0	1.7	0.1	2.8	10.7	3	8.6	1.8
0082_SS179_210303	**SS179**	**3/03/2021**	**EP2102192**	<0.0002	<0.0002	<0.0002	2.0	5.4	3.8	0.9	0.2	<0.1	5.0	64	9.4	0.8
0082_SS179_210621	**SS179**	**21/06/2021**	**EP2107026**	<0.0002	<0.0002	<0.0002	0.8	9.2	4.2	0.6	<0.1	<0.1	4.9	923	9.1	1.4

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

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFHxS+PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW022	MW103D	MW105S	MW109	MW113	MW115	MW118D
Sampling Event	Sampling Date	PFHXS+PFOS CONCENTRATION (ug/L)						
1	9-Mar-18	4.9	16	7	11	0.3	0.4	31
2	9-Jun-18	3	10	5.2	9.7	0.27	0.17	18
3	27-Nov-19	3.72	10.9	5.02	10	0.71	12.3	23.4
4	23-Jun-20	6.49	6.29		9.69	0.29	14.4	18.7
5	17-Nov-20		6.08		10.3	0.28	15.9	20.5
6	21-Jun-21	4.5	5.46	7.84	0.08	0.29	15.6	18.4
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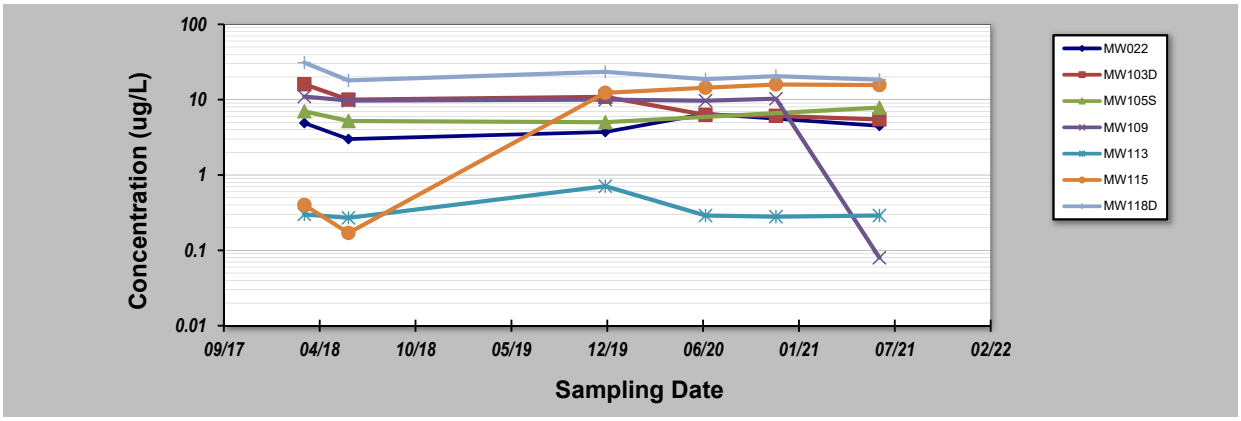
19								
20								
Coefficient of Variation:		0.29	0.44	0.22	0.49	0.49	0.76	0.23
Mann-Kendall Statistic (S):		2	-13	0	-7	-2	11	-5
Confidence Factor:		59.2%	99.2%	37.5%	86.4%	57.0%	97.2%	76.5%
Concentration Trend:		No Trend	Decreasing	Stable	Stable	Stable	Increasing	Stable



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:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFHxS+PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW122	MW126	MW128	MW129	MW130	MW131	MW132
Sampling Event	Sampling Date	PFHXS+PFOS CONCENTRATION (ug/L)						
1	5-Mar-18	2.3	0.4	0.0005	0.0005	0.0005	0.0005	0.0005
2	16-Jun-18	2.7	0.31	0.0005	0.0005	0.16	0.0005	0.01
3	27-Nov-19	2.75	1.75	0.0005	0.0005		0.0005	0.05
4	23-Jun-20	3.41	1.66	0.0005	0.0005	0.0005	0.0005	0.05
5	16-Nov-20	1.78		0.0005	0.0005	0.02	0.02	0.04
6	22-Jun-21	1.66	2.9	0.0005	0.0005	0.02	0.0005	0.0005
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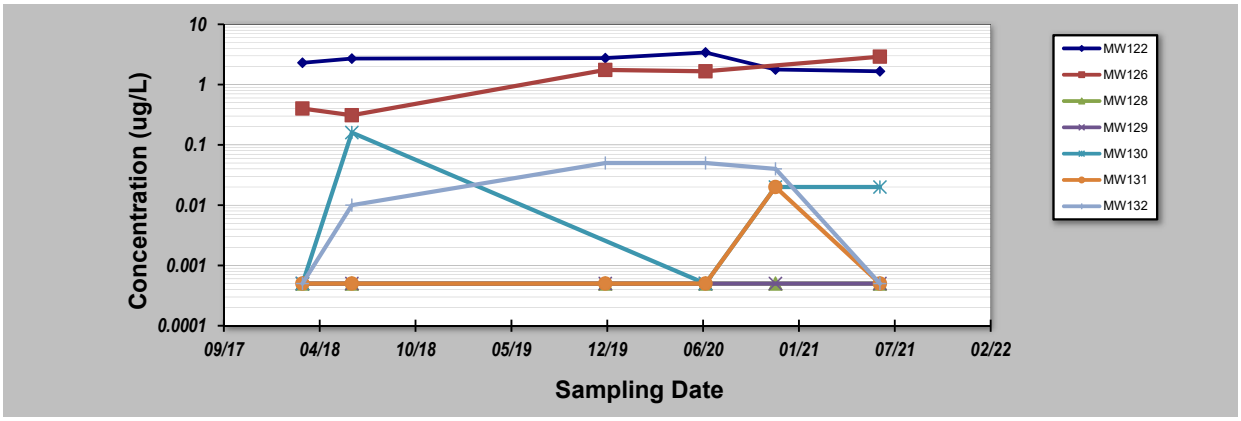
20								
Coefficient of Variation:		0.27	0.77	0.00	0.00	1.68	2.12	0.96
Mann-Kendall Statistic (S):		-3	6	0	0	2	3	1
Confidence Factor:		64.0%	88.3%	39.3%	39.3%	59.2%	64.0%	50.0%
Concentration Trend:		Stable	No Trend	Stable	Stable	No Trend	No Trend	No Trend



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: 5-Nov-21
Facility Name: HEH-B
Conducted By: Cardno

Job ID: DEF19009
Constituent: PFHxS+PFOS
Concentration Units: ug/L

Sampling Point ID:	MW133	MW134	MW135	MW137	MW142	MW143	MW144S
Sampling Event	Sampling Date	PFHXS+PFOS CONCENTRATION (ug/L)						
1	10-Mar-18	0.0005	0.0005	0.0005	0.0005			
2	21-Jun-18	0.022	0.002	0.012	0.007	7.4	4.6	4.6
3	27-Nov-19	0.16	0.0005	0.0005	0.0005	5.64	12.3	12.3
4	23-Jun-20	0.03	0.0005		0.0005	7.15	7.98	7.98
5	16-Nov-20	0.06	0.0005	0.0005	0.0005	6.66	8.06	8.06
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005	51.9	11.2	11.2
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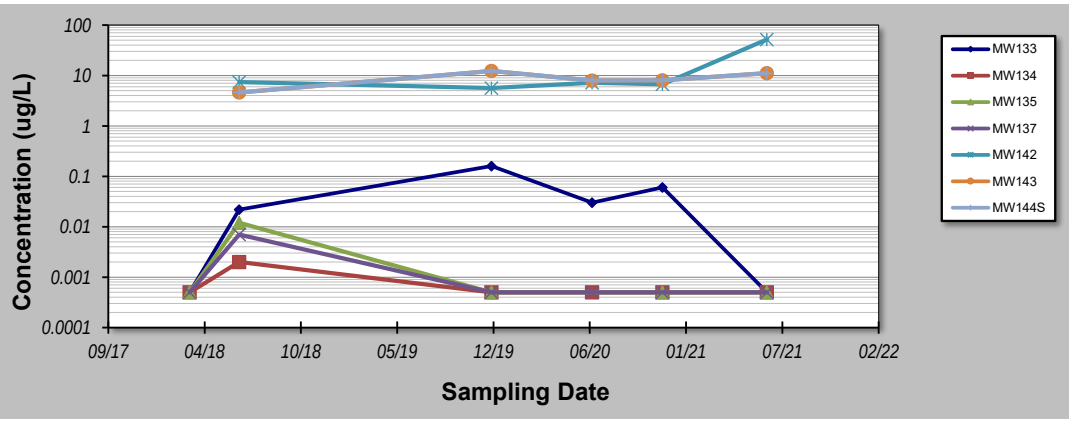
Coefficient of Variation:		1.32	0.82	1.84	1.68	1.28	0.34	0.34
Mann-Kendall Statistic (S):		2	0	0	-3	2	4	4
Confidence Factor:		57.0%	39.3%	40.8%	64.0%	59.2%	75.8%	75.8%
Concentration Trend:		No Trend	Stable	No Trend	No Trend	No Trend	No Trend	No Trend



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.
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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFHxS+PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW145	MW147	MW148S	MW151S	MW152S	MW153S	MW154S
Sampling Event	Sampling Date	PFHXS+PFOS CONCENTRATION (ug/L)						
1	1-Feb-18							
2	20-Jun-18	0.0005	0.008	0.006	0.0005	0.0005	0.0005	0.28
3	27-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.5
4	25-Jun-20	0.0005	0.0005	0.01	0.0005	0.0005	0.0005	0.94
5	17-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	1.29
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	1.07
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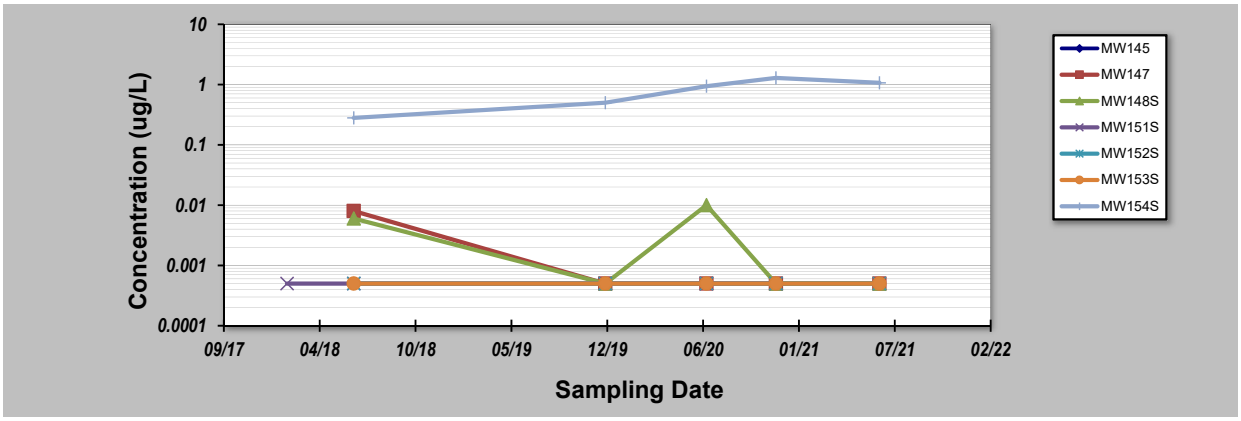
Coefficient of Variation:		0.00	1.68	1.24	0.00	0.00	0.00	0.51
Mann-Kendall Statistic (S):		0	-4	-3	0	0	0	8
Confidence Factor:		40.8%	75.8%	67.5%	40.8%	40.8%	40.8%	95.8%
Concentration Trend:		Stable	No Trend	No Trend	Stable	Stable	Stable	Increasing



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:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFHxS+PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW155S	MW310	MW311	MW315	MW326		
Sampling Event	Sampling Date	PFHXS+PFOS CONCENTRATION (ug/L)						
1	9-Mar-18		6.7					
2	18-Jun-18	0.0005	7.4	0.64	0.002	0.013		
3	27-Nov-19	0.0005	1.83	0.74	0.0005	0.03		
4	23-Jun-20	0.0005	5.56	0.94	0.0005	0.06		
5	17-Nov-20	0.0005	3.69	0.91	0.12	0.13		
6	21-Jun-21	0.0005	15.7	0.75	0.0005	0.08		
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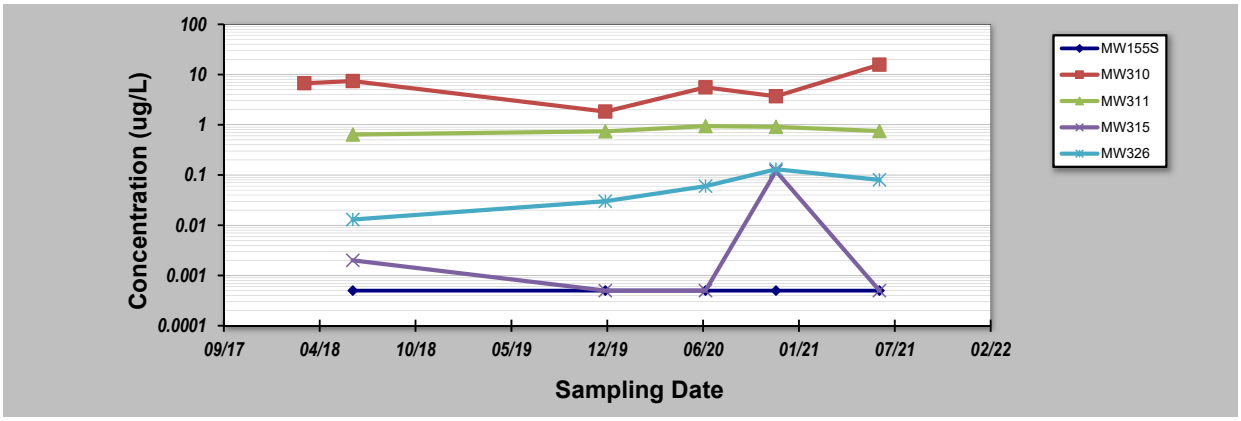
18								
19								
20								
Coefficient of Variation:		0.00	0.71	0.16	2.16	0.73		
Mann-Kendall Statistic (S):		0	1	4	-1	8		
Confidence Factor:		40.8%	50.0%	75.8%	50.0%	95.8%		
Concentration Trend:		Stable	No Trend	No Trend	No Trend	Increasing		



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:	8-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFHxS+PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	OTH101	OTH102	OTH103	OTH104	OTH105	OTH106
Sampling Event	Sampling Date	PFHXS+PFOS CONCENTRATION (ug/L)					
1	26-Feb-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
2	21-Jun-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
3	28-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	26-Jun-20	0.0005	0.01	0.0005	0.0005	0.0005	0.0005
5	16-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
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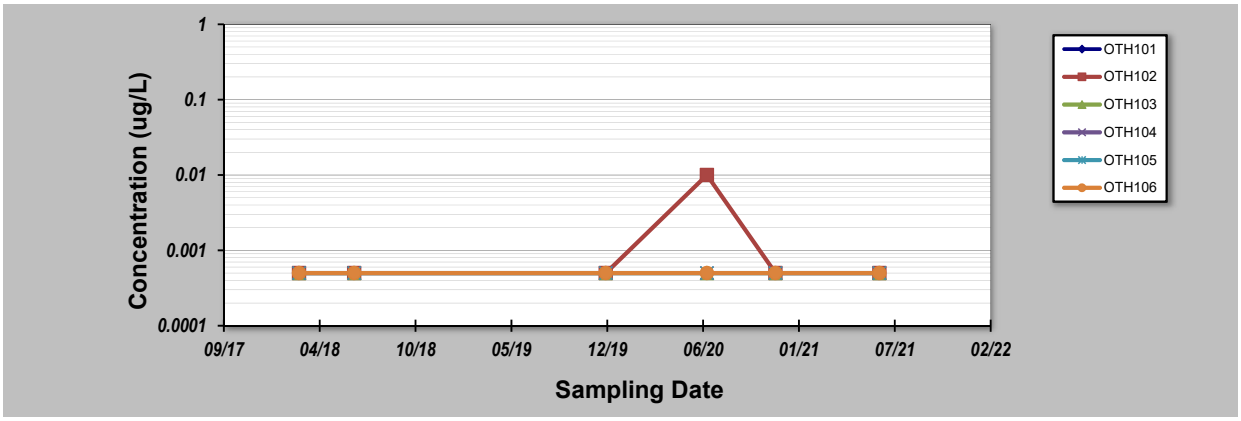
17							
18							
19							
20							
Coefficient of Variation:		0.00	1.86	0.00	0.00	0.00	0.00
Mann-Kendall Statistic (S):		0	1	0	0	0	0
Confidence Factor:		39.3%	50.0%	39.3%	39.3%	39.3%	39.3%
Concentration Trend:		Stable	No Trend	Stable	Stable	Stable	Stable



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	8-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFHxS+PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	SW161	SW162	SW163	SW181			
Sampling Event	Sampling Date	PFHXS+PFOS CONCENTRATION (ug/L)						
1	23-Jun-18	0.008	0.0005	0.008	0.005			
2	26-May-20	0.0005	0.0005	0.0005	0.0005			
3	23-Jun-20	0.0005	0.0005	0.0005	0.0005			
4	3-Mar-21	0.0005	0.0005	0.0005	0.0005			
5	21-Jun-21	0.0005	0.0005	0.0005	0.0005			
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17								
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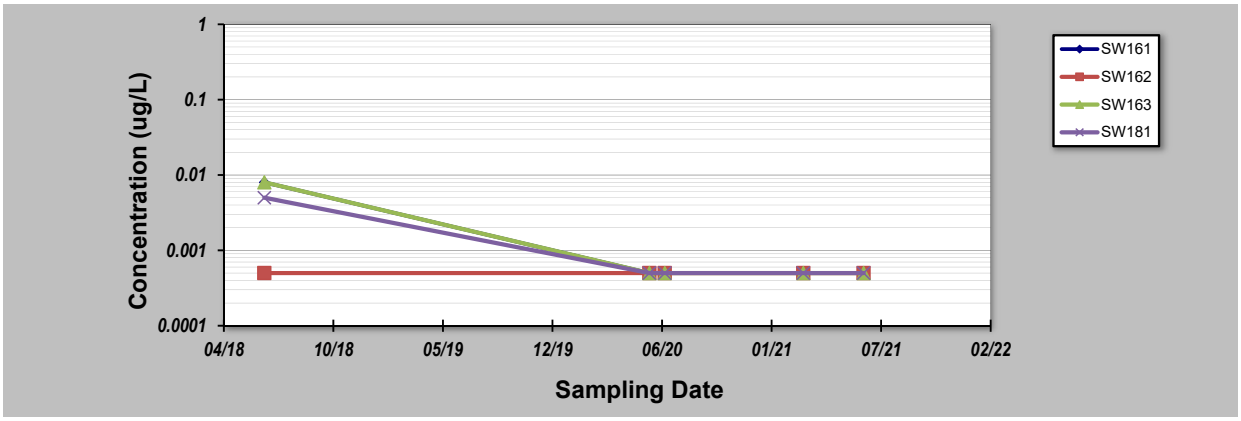
20								
Coefficient of Variation:		1.68	0.00	1.68	1.44			
Mann-Kendall Statistic (S):		-4	0	-4	-4			
Confidence Factor:		75.8%	40.8%	75.8%	75.8%			
Concentration Trend:		No Trend	Stable	No Trend	No Trend			



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:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW022	MW103D	MW105S	MW109	MW113	MW115	MW118D
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	9-Mar-18	0.33	0.14	0.18	0.17	0.007	0.12	1.8
2	9-Jun-18	0.32	0.13	0.14	0.15	0.006	0.13	1.5
3	27-Nov-19	0.37	0.1	0.13	0.14	0.01	0.4	1.23
4	23-Jun-20	0.81	0.09		0.2	0.0005	0.68	1.28
5	17-Nov-20		0.08		0.18	0.0005	0.55	1.1
6	21-Jun-21	0.56	0.08	0.33	0.0005	0.0005	0.53	1.24
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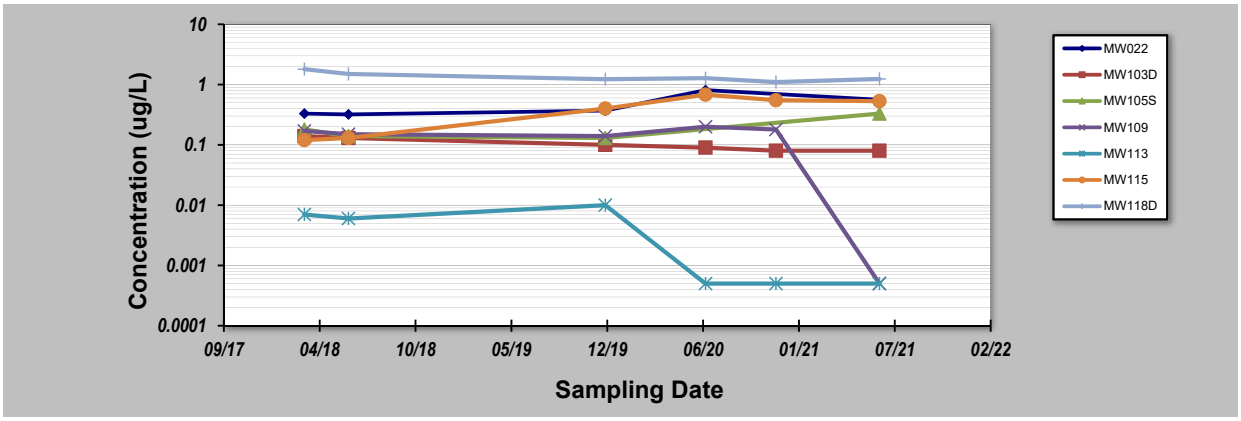
20								
Coefficient of Variation:		0.44	0.25	0.47	0.51	1.01	0.58	0.19
Mann-Kendall Statistic (S):		6	-14	0	-3	-8	9	-9
Confidence Factor:		88.3%	99.6%	37.5%	64.0%	89.8%	93.2%	93.2%
Concentration Trend:		No Trend	Decreasing	Stable	Stable	No Trend	Prob. Increasing	Prob. Decreasing



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:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW122	MW126	MW128	MW129	MW130	MW131	MW132
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	5-Mar-18	0.12	0.06	0.001	0.0005	0.0005	0.0005	0.025
2	16-Jun-18	0.19	0.05	0.0005	0.0005	0.002	0.0005	0.008
3	27-Nov-19	0.18	0.11	0.0005	0.0005		0.0005	0.0005
4	23-Jun-20	0.29	0.13	0.0005	0.0005	0.0005	0.0005	0.0005
5	16-Nov-20	0.16		0.0005	0.0005	0.0005	0.0005	0.0005
6	22-Jun-21	0.12	0.16	0.0005	0.0005	0.0005	0.0005	0.0005
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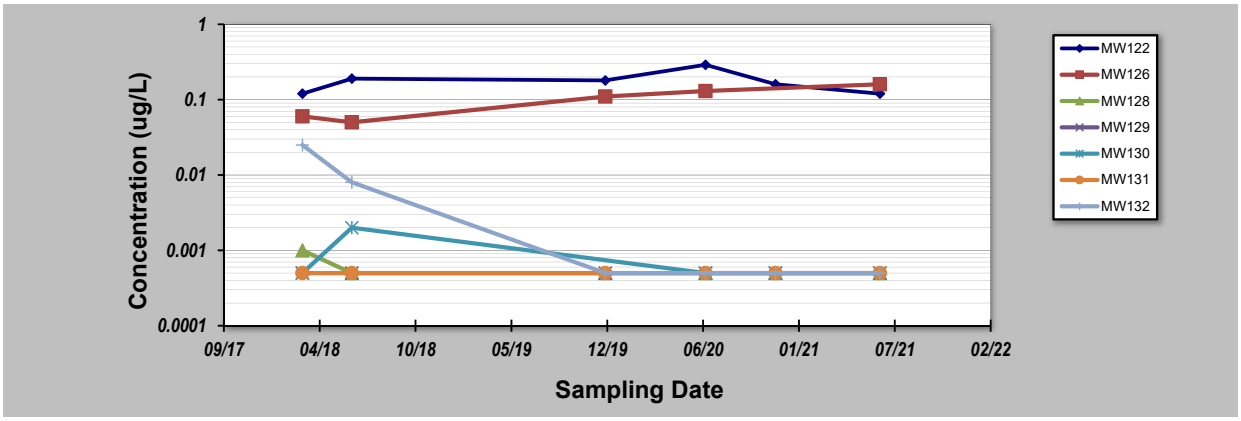
Coefficient of Variation:		0.36	0.46	0.35	0.00	0.84	0.00	1.69
Mann-Kendall Statistic (S):		-2	8	-5	0	-2	0	-9
Confidence Factor:		57.0%	95.8%	76.5%	39.3%	59.2%	39.3%	93.2%
Concentration Trend:		Stable	Increasing	Stable	Stable	Stable	Stable	Prob. Decreasing



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:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW132	MW133	MW134	MW135	MW137	MW142	MW143
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	3-Mar-18	0.025	0.006	0.001	0.001	0.001		
2	20-Jun-18	0.008	0.002	0.0005	0.0005	0.0005	0.59	0.48
3	27-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.28	0.47
4	23-Jun-20	0.0005	0.0005	0.0005		0.0005	0.27	0.39
5	16-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.14	0.37
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.74	0.3
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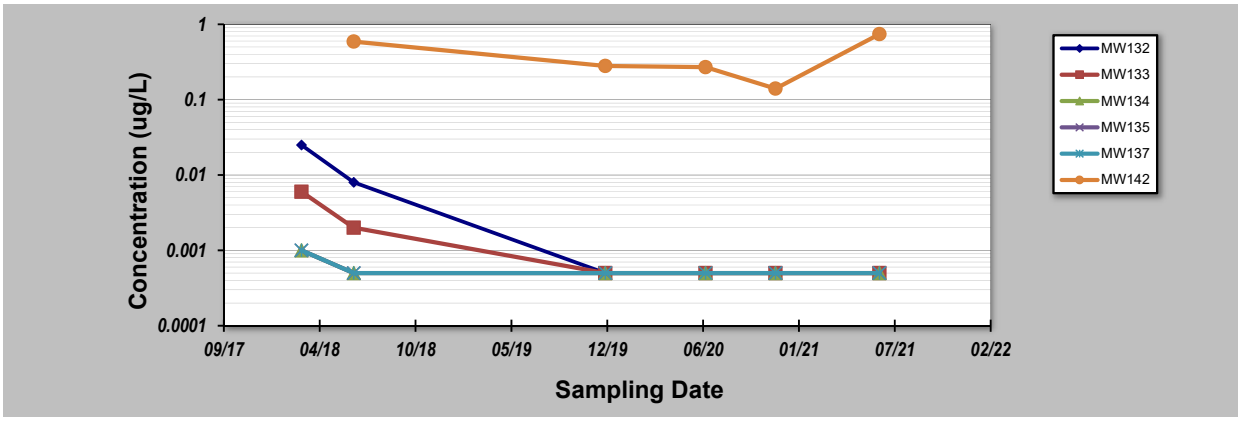
Coefficient of Variation:		1.69	1.32	0.35	0.37	0.35	0.62	0.19
Mann-Kendall Statistic (S):		-9	-9	-5	-4	-5	-2	-10
Confidence Factor:		93.2%	93.2%	76.5%	75.8%	76.5%	59.2%	99.2%
Concentration Trend:		Prob. Decreasing	Prob. Decreasing	Stable	Stable	Stable	Stable	Decreasing



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW144S	MW145	MW147	MW148S	MW151S	MW152S	MW153S
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	9-Mar-18							
2	23-Jun-18	0.6	0.12	0.0005	0.0005	0.0005	0.0005	0.0005
3	28-Nov-19	0.66	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	25-Jun-20	0.55	0.0005		0.0005	0.0005	0.0005	0.0005
5	17-Nov-20	0.58	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	21-Jun-21	0.95	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
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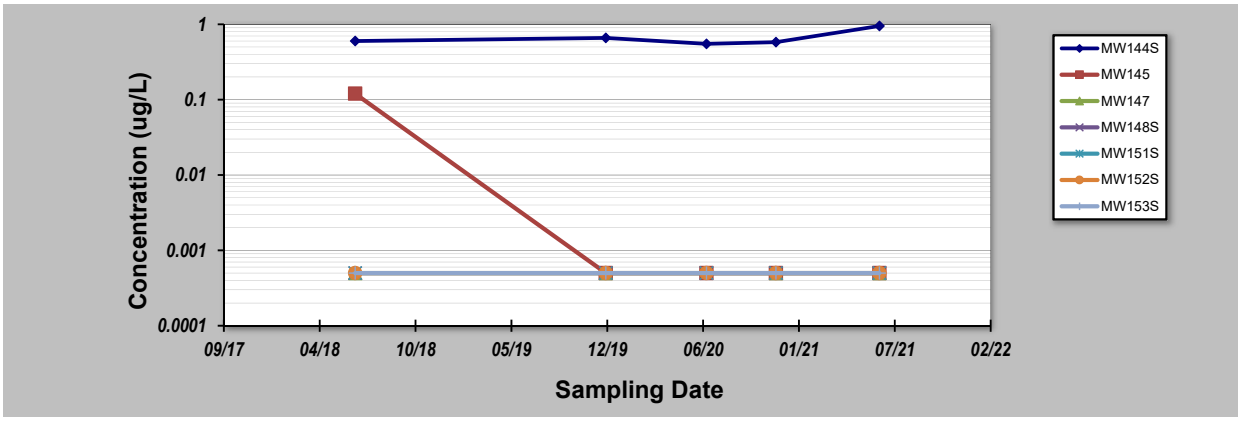
Coefficient of Variation:		0.24	2.19	0.00	0.00	0.00	0.00	0.00
Mann-Kendall Statistic (S):		2	-4	0	0	0	0	0
Confidence Factor:		59.2%	75.8%	37.5%	40.8%	40.8%	40.8%	40.8%
Concentration Trend:		No Trend	No Trend	Stable	Stable	Stable	Stable	Stable



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW154S	MW155S	MW310	MW311	MW315	MW326	
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)					
1	9-Mar-18			0.16		0.0005	0.004
2	21-Jun-18	0.033	0.0005	0.17	0.032	0.0005	0.003
3	28-Nov-19	0.02	0.0005	0.07	0.03	0.0005	0.0005
4	23-Jun-20	0.05	0.0005	0.17	0.06	0.0005	0.0005
5	17-Nov-20	0.05	0.0005	0.12	0.05	0.0005	0.0005
6	21-Jun-21	0.05	0.0005	0.34	0.08	0.0005	0.02
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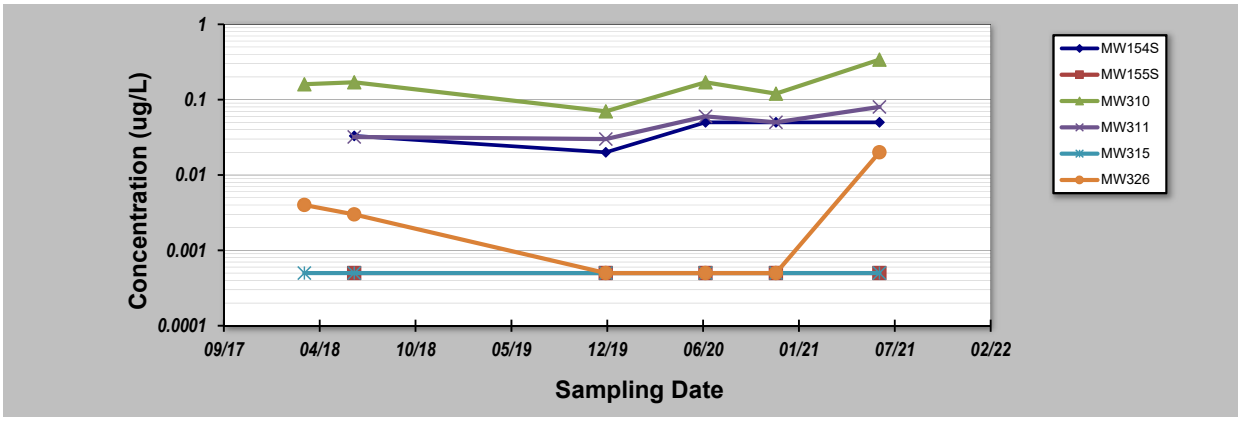
Coefficient of Variation:		0.34	0.00	0.53	0.41	0.00	1.60
Mann-Kendall Statistic (S):		5	0	4	6	0	-2
Confidence Factor:		82.1%	40.8%	70.3%	88.3%	39.3%	57.0%
Concentration Trend:		No Trend	Stable	No Trend	No Trend	Stable	No Trend



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	8-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	OTH101	OTH102	OTH103	OTH104	OTH105	OTH106	
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	26-Feb-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
2	26-Jun-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
3	28-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
4	26-Jun-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
5	16-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
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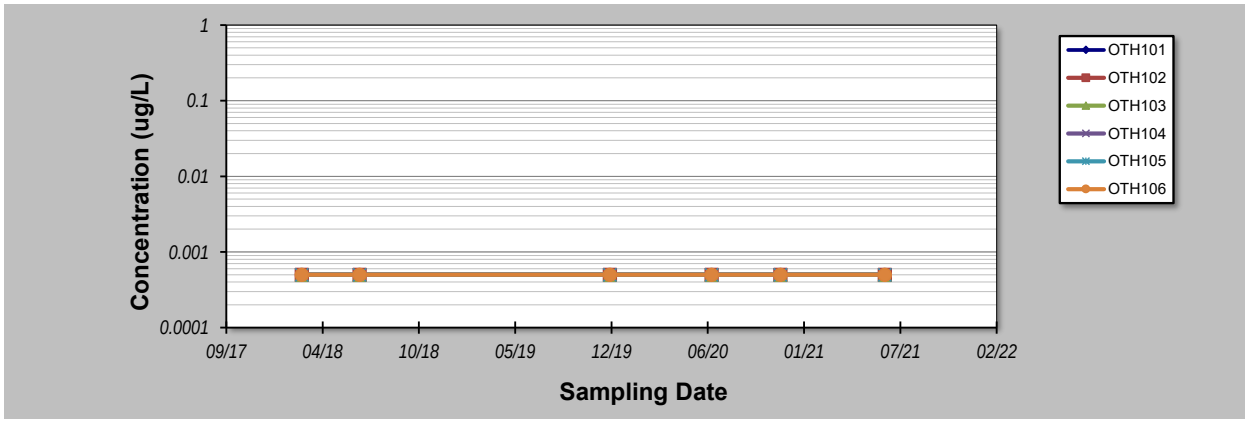
Coefficient of Variation:		0.00	0.00	0.00	0.00	0.00	0.00	
Mann-Kendall Statistic (S):		0	0	0	0	0	0	
Confidence Factor:		39.3%	39.3%	39.3%	39.3%	39.3%	39.3%	
Concentration Trend:		Stable	Stable	Stable	Stable	Stable	Stable	



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	8-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOA
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	SW161	SW162	SW163	SW181			
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	25-Feb-18	0.0005	0.0005	0.0005	0.0005			
2	23-Jun-18	0.0005	0.0005	0.0005	0.0005			
3	26-May-20	0.0005	0.0005	0.0005	0.0005			
4	23-Jun-20	0.0005	0.0005	0.0005	0.0005			
5	3-Mar-21	0.0005	0.0005	0.0005	0.0005			
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005			
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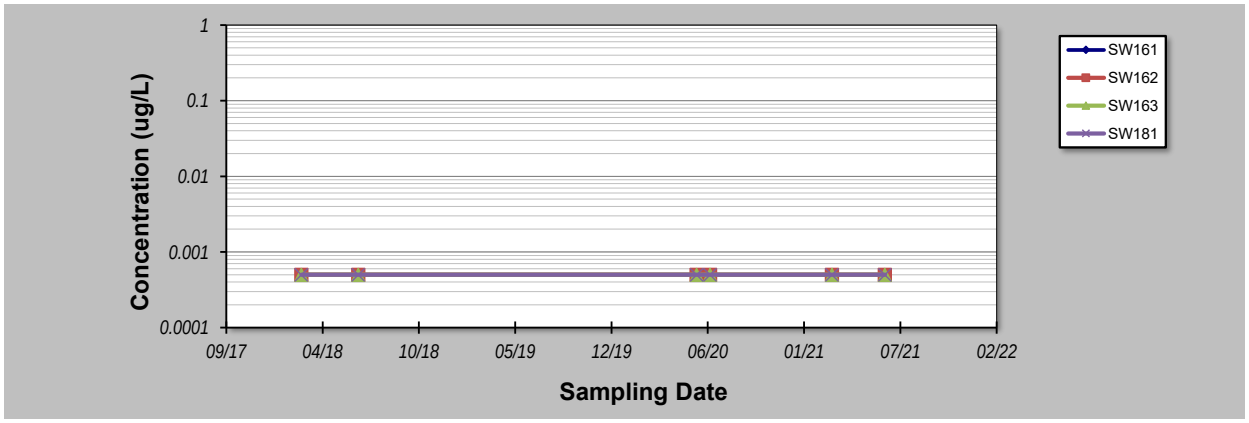
Coefficient of Variation:		0.00	0.00	0.00	0.00			
Mann-Kendall Statistic (S):		0	0	0	0			
Confidence Factor:		39.3%	39.3%	39.3%	39.3%			
Concentration Trend:		Stable	Stable	Stable	Stable			



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW022	MW103D	MW105S	MW109	MW113	MW115	MW118D
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	9-Mar-18	3.2	13	6	1.8	0.052	0.27	18
2	9-Jun-18	1.9	7.5	4.6	1.1	0.054	0.046	11
3	27-Nov-19	2.33	8	3.92	1.41	0.39	9.12	16.4
4	23-Jun-20	4.1	3.57		1.87	0.05	10.4	11.6
5	17-Nov-20		4.03		2.22	0.06	12.2	14.3
6	21-Jun-21	3.19	2.64	6.18	0.0005	0.06	12.2	12.9
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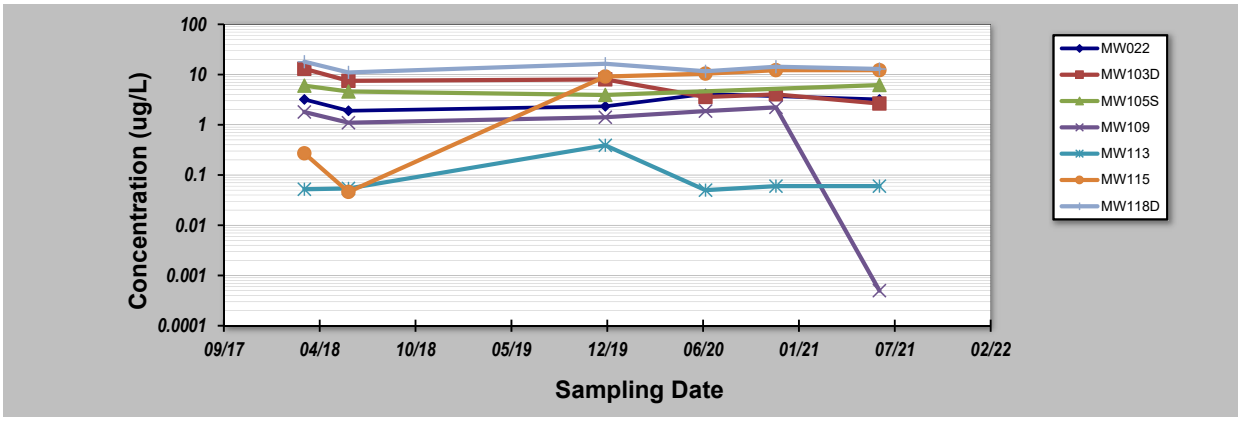
Coefficient of Variation:		0.29	0.60	0.21	0.56	1.23	0.77	0.20
Mann-Kendall Statistic (S):		2	-11	0	1	4	12	-3
Confidence Factor:		59.2%	97.2%	37.5%	50.0%	70.3%	98.2%	64.0%
Concentration Trend:		No Trend	Decreasing	Stable	No Trend	No Trend	Increasing	Stable



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW118D	MW122	MW126	MW128	MW129	MW130	MW131
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	5-Mar-18	18	0.16	0.26	0.002	0.0005	0.048	0.004
2	9-Jun-18	11	0.19	0.25	0.0005	0.0005	0.004	0.002
3	27-Nov-19	16.4	0.15	1.06	0.0005	0.0005		0.0005
4	23-Jun-20	11.6	0.26	1.04	0.0005	0.0005	0.0005	0.0005
5	16-Nov-20	14.3	0.25		0.0005	0.0005	0.02	0.02
6	21-Jun-21	12.9	0.32	2.25	0.0005	0.0005	0.02	0.0005
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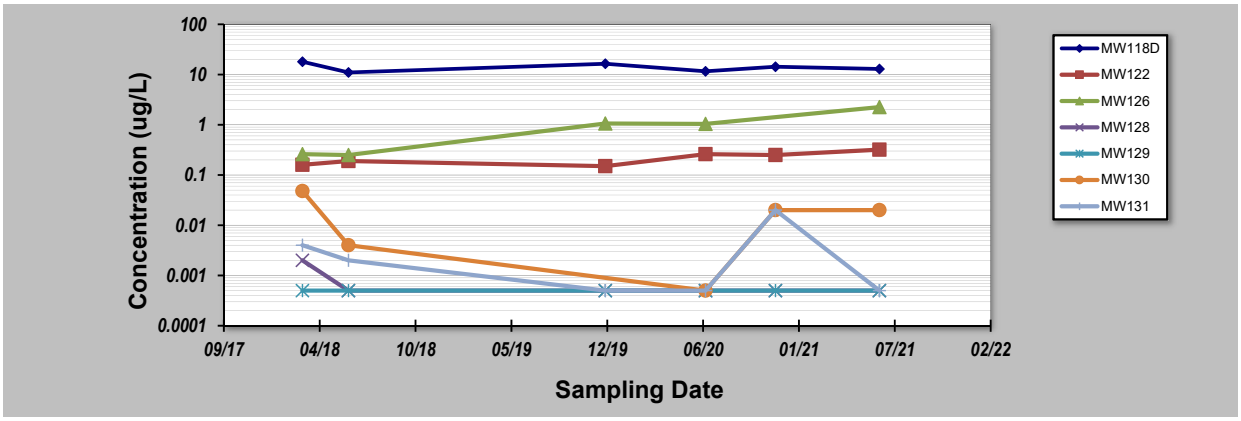
Coefficient of Variation:		0.20	0.30	0.84	0.82	0.00	1.01	1.68
Mann-Kendall Statistic (S):		-3	9	6	-5	0	-1	-4
Confidence Factor:		64.0%	93.2%	88.3%	76.5%	39.3%	50.0%	70.3%
Concentration Trend:		Stable	Prob. Increasing	No Trend	Stable	Stable	No Trend	No Trend



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW132	MW133	MW134	MW135	MW137	MW142	MW143
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	9-Mar-18	0.004	0.03	0.003	0.0005	0.015		
2	9-Jun-18	0.002	0.02	0.002	0.012	0.007	6.8	4.1
3	27-Nov-19	0.0005	0.12	0.0005	0.0005	0.0005	4.56	8.93
4	23-Jun-20	0.0005	0.03	0.0005	0.0005	0.0005	6.14	4.69
5	17-Nov-20	0.0005	0.06	0.0005	0.0005	0.0005	5.92	4.81
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	48.6	2.7
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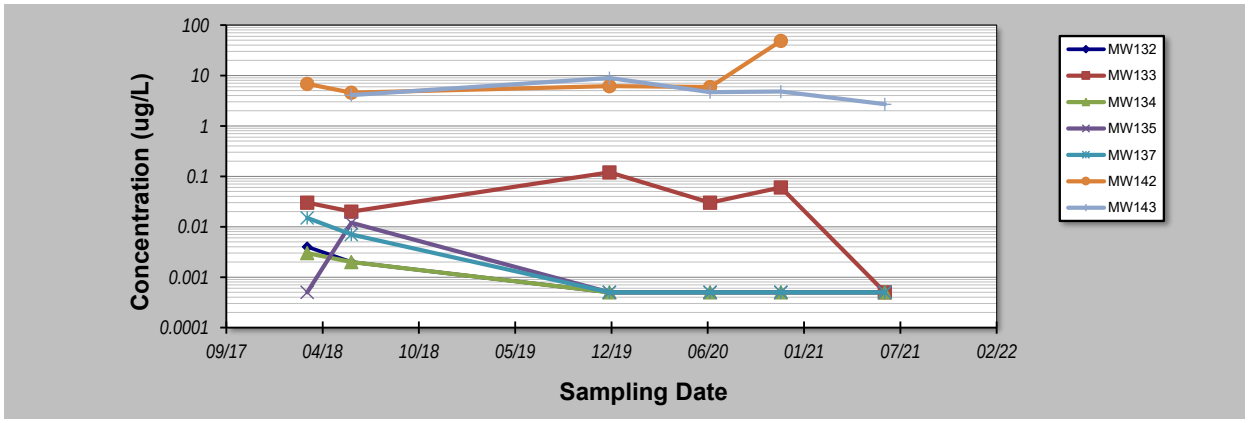
Coefficient of Variation:		1.08	0.97	0.93	1.94	1.50	1.33	0.46
Mann-Kendall Statistic (S):		-9	-2	-9	-3	-9	2	-2
Confidence Factor:		93.2%	57.0%	93.2%	64.0%	93.2%	59.2%	59.2%
Concentration Trend:		Prob. Decreasing	Stable	Prob. Decreasing	No Trend	Prob. Decreasing	No Trend	Stable



Notes:

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GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW144S	MW145	MW147	MW148S	MW151S	MW152S	MW153S
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	21-Feb-18							
2	9-Jun-18	4	0.19	0.008	0.006	0.0005	0.0005	0.0005
3	27-Nov-19	9.86	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	23-Jun-20	6.06	0.0005		0.01	0.0005	0.0005	0.0005
5	24-Nov-20	5.97	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	22-Jun-21	8.36	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
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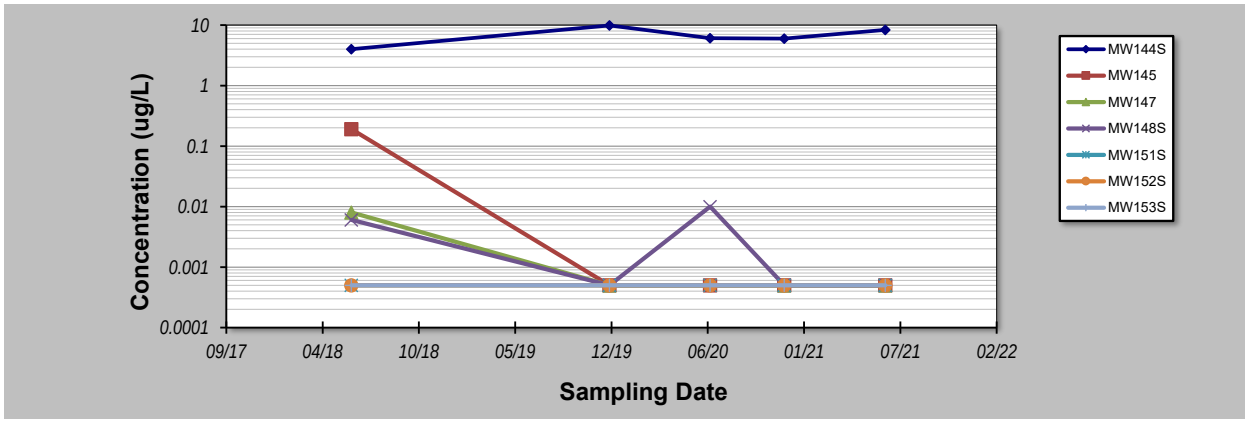
Coefficient of Variation:		0.33	2.21	1.58	1.24	0.00	0.00	0.00
Mann-Kendall Statistic (S):		2	-4	-3	-3	0	0	0
Confidence Factor:		59.2%	75.8%	72.9%	67.5%	40.8%	40.8%	40.8%
Concentration Trend:		No Trend	No Trend	No Trend	No Trend	Stable	Stable	Stable



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:	5-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	MW153S	MW154S	MW155S	MW310	MW311	MW315	MW326
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	22-Feb-18				0.78		0.001	0.007
2	21-Jun-18	0.0005	0.25	0.0005	0.66	0.38	0.002	0.01
3	28-Nov-19	0.0005	0.22	0.0005	0.32	0.41	0.0005	0.0005
4	23-Jun-20	0.0005	0.42	0.0005	0.82	0.52	0.0005	0.01
5	17-Nov-20	0.0005	0.73	0.0005	0.65	0.55	0.1	0.07
6	21-Jun-21	0.0005	0.54	0.0005	3.66	0.26	0.0005	0.02
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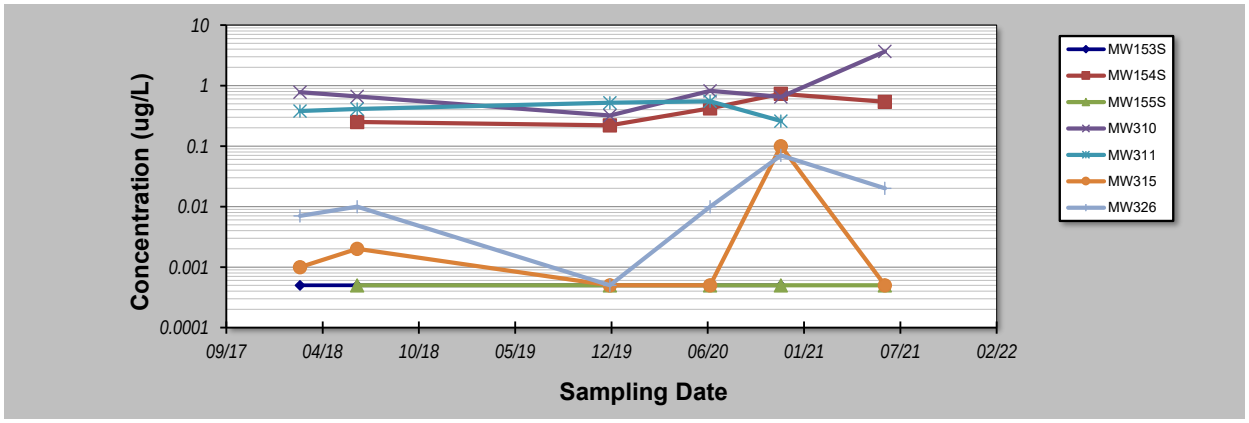
Coefficient of Variation:		0.00	0.49	0.00	1.08	0.27	2.32	1.30
Mann-Kendall Statistic (S):		0	6	0	3	2	-2	8
Confidence Factor:		40.8%	88.3%	40.8%	64.0%	59.2%	57.0%	89.8%
Concentration Trend:		Stable	No Trend	Stable	No Trend	No Trend	No Trend	No Trend



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: 8-Nov-21
Facility Name: HEH-B
Conducted By: Cardno

Job ID: DEF19009
Constituent: PFOS
Concentration Units: ug/L

Sampling Point ID:	OTH101	OTH102	OTH103	OTH104	OTH105	OTH106	
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	26-Feb-18	0.0005	0.006	0.0005	0.0005	0.002	0.002	
2	21-Jun-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
3	28-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
4	26-Jun-20	0.0005	0.01	0.0005	0.0005	0.0005	0.0005	
5	16-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
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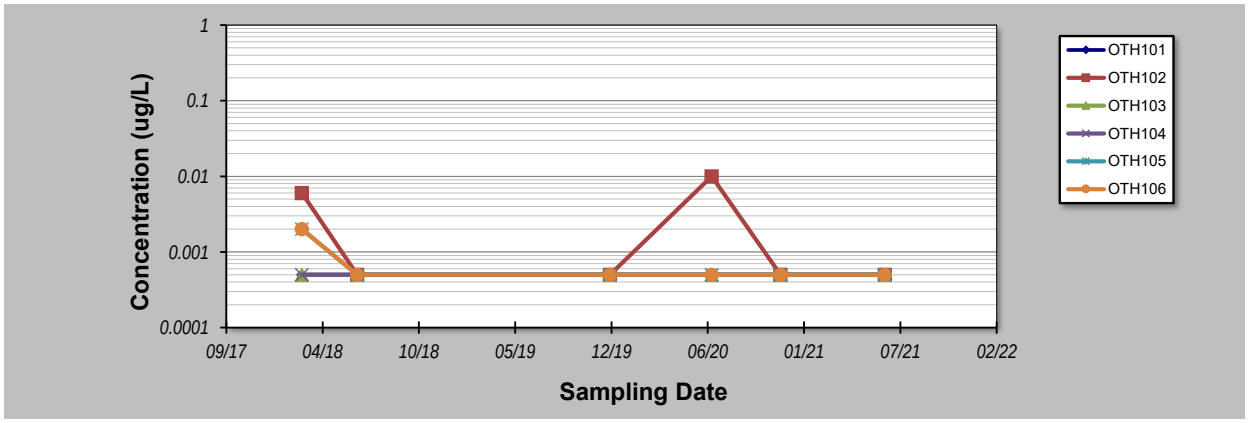
Coefficient of Variation:		0.00	1.36	0.00	0.00	0.82	0.82	
Mann-Kendall Statistic (S):		0	-3	0	0	-5	-5	
Confidence Factor:		39.3%	64.0%	39.3%	39.3%	76.5%	76.5%	
Concentration Trend:		Stable	No Trend	Stable	Stable	Stable	Stable	



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:	8-Nov-21	Job ID:	DEF19009
Facility Name:	HEH-B	Constituent:	PFOS
Conducted By:	Cardno	Concentration Units:	ug/L

Sampling Point ID:	SW161	SW162	SW163	SW181			
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	25-Feb-18	0.0005	0.003	0.0005	0.005			
2	23-Jun-18	0.008	0.0005	0.008	0.0005			
3	26-May-20	0.0005	0.0005	0.0005	0.0005			
4	23-Jun-20	0.0005	0.0005	0.0005	0.0005			
5	3-Mar-21	0.0005	0.0005	0.0005	0.0005			
6	21-Jun-21	0.0005	0.0005	0.0005	0.0005			
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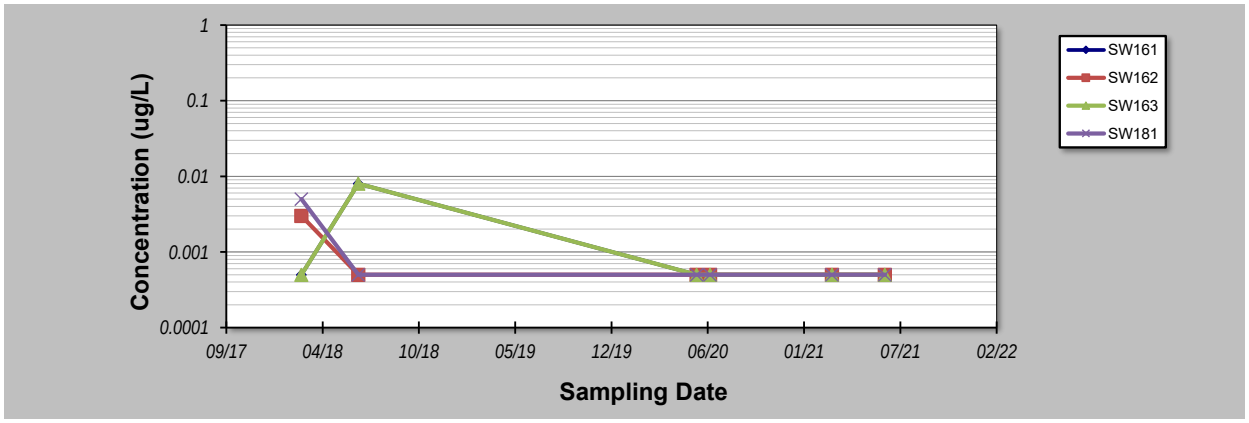
Coefficient of Variation:		1.75	1.11	1.75	1.47			
Mann-Kendall Statistic (S):		-3	-5	-3	-5			
Confidence Factor:		64.0%	76.5%	64.0%	76.5%			
Concentration Trend:		No Trend	No Trend	No Trend	No Trend			



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.