



RAAF Base Williamtown – Stage 2B Environmental Investigation

Human Health Risk Assessment – Key Findings and Next Steps

About the Investigation

The Department of Defence (Defence) has engaged an independent environmental consultant to undertake an environmental investigation and assessment of the soil, surface water, sediment, biota and groundwater at, and in the vicinity of, RAAF Base Williamtown (the base) and surrounds (off-site), including the NSW Environment Protection Authority (EPA) Investigation Area. This Stage 2B investigation continued the studies completed at the site during 2014-2015 (Stage 2A Investigation).

The purpose of the investigation is to better understand impacts to the environment from the historical use of aqueous film forming foam (AFFF), which are now known to have contained per- and poly-fluoroalkyl substances (PFAS) (including perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA)). Defence has phased out the use of AFFF containing PFOS and PFOA as active ingredients and is proactively managing legacy contamination across its estate.

A Human Health Risk Assessment (HHRA) has now been undertaken by the environmental consultant to review and assess the data collected during the Stage 2A and Stage 2B investigations, with regard to human health.

Objectives of the HHRA

To assess the possible human health risks in the off-base EPA Investigation Area associated with exposure to PFAS impacted soil, groundwater, surface water, sediment and biota (plants and animals, including fish).

HHRA investigations

Development of the HHRA included:

- Consideration of off-site data collected during the Stage 2A and Stage 2B investigations and by NSW government including sample results from soil, sediment,

surface water, groundwater, residential bore, tank and pool water, as well as terrestrial and aquatic biota.

- Identification of groups of people (receptors) who may be exposed to PFAS.
- Conduct of community surveys to identify potential ways people could be exposed to PFAS (exposure pathways).
- Risk characterisation by comparison of estimated PFAS intakes to acceptable levels.

Assessment of personal exposure

The HHRA assessed 21 different exposure scenarios both at typical and upper (or high) estimates of exposure. Exposure scenarios were developed based on feedback received through the Community Survey. It is recognised that not all receptors within the Stage 2B Investigation Area may associate with a given scenario.

The HHRA was undertaken based on adoption of toxicity values established by European Food Safety Authority (EFSA) as recommended by ToxConsult, an Australian toxicology specialist.

In June 2016, the NSW Department of Health released interim health drinking water and surface water guidelines which had been developed by the Environmental Health Standing Committee (enHealth). These interim health guidelines were derived using the EFSA toxicity reference value.

The Australian Government is currently undertaking an independent review of the enHealth guidelines. Defence's consultant will review the Williamtown HHRA following completion of the review of enHealth guidelines.

The HHRA considered multiple hypothetical exposure scenarios, each including multiple exposure pathways for a number of hypothetical groups of people. Receptors considered in the HHRA include:

- residents or consumers of low quantities of local seafood
- recreational fishers or consumers of moderate quantities of local seafood
- commercial fishers or consumers of high quantities of local seafood
- workers (who conduct maintenance on surface water drains and maintain below ground services)
- visitors, who frequently visit the EPA Investigation Area to conduct boating/swimming activities
- beef farmers or consumers of high quantities of local grown beef.





The potential exposure pathways that were considered included ingestion, skin contact and/or inhalation of PFAS impacted materials such as:

- groundwater, surface water, soil, sediment and dust
- home-grown produce including beef and chicken eggs and honey and milk from cows
- seafood
- breastmilk.

During the HHRA development, soil and groundwater sample results from the area south of the base (the Southern Area, Refer to Figure 1) were identified as distinct to the rest of the off-Site EPA Investigation Area. Therefore, the assessment of potential health risks in these two areas was conducted separately.

HHRA key findings

The key findings of the HHRA are summarised following and presented in more detail in Table 1.

In the EPA Investigation Area, risks from the following pathways are low and acceptable:

- Inhalation of dust from soil irrigated with groundwater
- Incidental or unintentional ingestion and skin contact with surface water and groundwater – pools, dams surface water bodies

- Incidental ingestion and skin contact with soil and sediment in outdoor activities
- Consumption of locally sourced seafood including finfish, prawns, crabs and oysters.

The phrase 'low and acceptable' which appears throughout the report is standard terminology used in human health risk assessments completed in accordance with the National Environment Protection Measures (NEPM). This phrase refers to circumstances where the level of risk is calculated to be below the threshold where possible health impacts may occur. Even though there is no consistent international evidence that PFOS/ PFOA cause adverse health effects, this phrase is used, as it is in accordance with the NEPM.

In the EPA Investigation Area, possible risks may result from upper level exposure for:

- Drinking of groundwater
- Eating large quantities of eggs from backyard chickens that drink PFAS impacted surface water.

In the Southern Area, possible risks may result from exposure for:

- Drinking of groundwater
- Incidental or unintentional ingestion of groundwater while showering, bathing, use in pools or sprinkler play
- Eating eggs from backyard chickens
- Eating beef grown in the Southern Area
- Drinking milk from cows grown in the Southern Area.

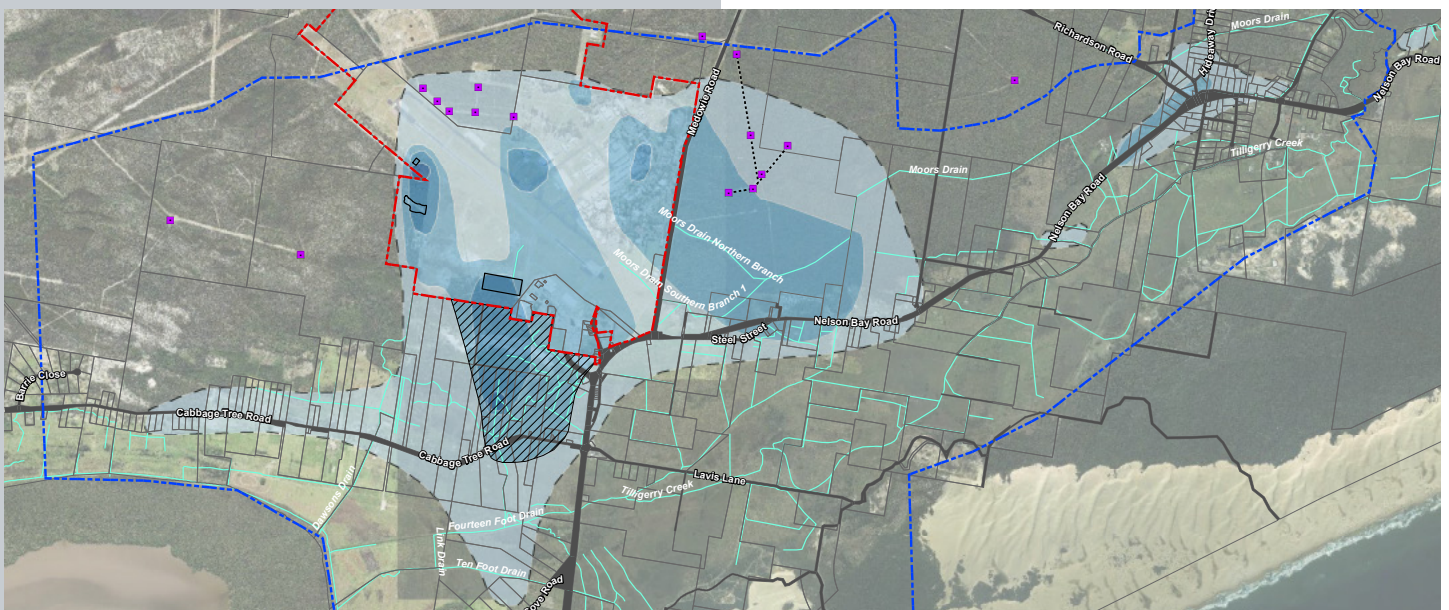


FIGURE 1 – INDICATIVE SOUTHERN AREA (ILLUSTRATED IN BLACK HASH LINES)





Exposure pathway	Receptor / Exposed Community	Potential Risk - Stage 2B Investigation Area ³		Potential Risk - Southern Area		Precautions suggested in the HHRA
		Upper ⁶	Typical ⁷	Upper ⁶	Typical ⁷	
Groundwater						
Ingestion of groundwater	Residents ¹	Elevated	Low & Acceptable	Elevated ⁴	Elevated ⁴	Restrict the use of groundwater for drinking
Incidental ingestion of groundwater as a result of indoor use (excluding drinking water), outdoor use (including swimming pools, dams and surface water bodies) and irrigation	Residents ¹ , non-resident council workers and visitors ²	Low & Acceptable	Low & Acceptable	Elevated	Low & Acceptable	Restrict the use of groundwater for: showering and bathing; filling swimming pools and children's wading pools; and, sprinkler play.
Dermal contact with groundwater as a result of indoor use, outdoor use (including swimming pools, and dams) and irrigation	Residents ¹ , non-resident council workers and visitors ²	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Surface Water						
Incidental ingestion of surface water as a result of outdoor use (including swimming pools, dams and surface water bodies) and irrigation	Residents ¹ , non-resident commercial fishers, non-resident council workers and visitors ²	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Dermal contact with surface water as a result of outdoor use (including swimming pools, dams and surface water bodies) and irrigation	Residents ¹ , non-resident commercial fishers, non-resident council workers and visitors ²	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Soil and Sediment						
Incidental ingestion of soil and sediment as a result of outdoor activities	Residents ¹ , non-resident commercial fishers, non-resident council workers and visitors ²	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Dermal contact with soil and sediment as a result of outdoor activities	Residents ¹ , non-resident commercial fishers, non-resident council workers and visitors ²	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Inhalation of Dust as a result of indoor and outdoor activities (from soil irrigated by PFAS impacted groundwater or flooded by PFAS impacted surface water)	Residents ¹ , non-resident commercial fishers, non-resident council workers and visitors ²	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Locally Sourced Food						
Consumption of locally sourced seafood (including finfish, prawns, crabs and oysters)	Residents ¹ , non-resident commercial fishers	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Consumption of locally grown fruit and vegetables	Residents ¹	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Consumption of honey	Residents ¹	Low & Acceptable	Low & Acceptable	Low & Acceptable	Low & Acceptable	None Advised
Consumption of beef from locally grown cattle and exposed to surface water as their primary drinking water supply	Residents ¹	Low & Acceptable	Low & Acceptable	Elevated	Low & Acceptable	Restrict consumption of beef from cattle grown in the Southern Area and exposed to surface water (or groundwater ⁵) from within the Southern Area as their primary drinking water source
Consumption of eggs from locally grown backyard chickens that are exposed to groundwater as their primary drinking water supply	Residents ¹	Elevated	Low & Acceptable	Elevated ⁴	Elevated ⁴	Restrict consumption of eggs from backyard chickens exposed to surface water or drinking water within the Stage 2B Investigation Area
Consumption of milk from locally grown dairy cows that are exposed to surface water as their primary drinking water supply	Residents ¹	Elevated	Low & Acceptable	Elevated	Low & Acceptable	Restrict consumption of milk from dairy cows exposed to surface water (or groundwater from within the Southern Area ⁵) as their primary drinking water source

Notes

TABLE DEVELOPED BY THE ENVIRONMENTAL CONSULTANCY FIRM ENGAGED TO PRODUCE THE HHRA

- Residents includes recreational fishers / moderate locally sourced seafood consumers and commercial fishers / high locally sourced seafood consumers
- Visitors were not assessed in the Southern Area
- Stage 2B Investigation Area excludes the Site and the Southern Area
- Risk estimates did not take into account current management actions advising against the drinking of groundwater and eating eggs from backyard chickens who have groundwater as the primary drinking water source within the Stage 2B Investigation Area for the Southern Area
- Risk estimates for consumption of beef and milk were assessed based on the assumption that the cattle were exposed to surface water as their primary source of drinking water. However, the groundwater concentrations reported in the Southern Area are greater than those reported in the surface water. Therefore, if the risk estimate was based on the groundwater concentrations, the risk estimates for consumption of beef and milk would also be elevated
- Upper exposure scenario - is intended to be protective of a reasonable maximum exposure (RME) and provide an assessment of potential risk from exposure that is reflective of the upper / high end of the range of exposure frequency and exposure concentrations. The upper exposure scenario would be expected to apply to only a small percentage of the population.
- Typical exposure scenario - is intended to be protective of the average exposure and provide an assessment of potential risk from exposure that is reflective of typical exposure frequency and exposure concentrations. The typical exposure scenario would be expected to apply to the majority of the population.





Next Steps

Further Considerations

The results of this HHRA provide an improved understanding of the potential human health risks to identified off-site receptors associated with exposure to PFAS impacted soil, groundwater, surface water, sediment, terrestrial biota and aquatic biota within the NSW EPA Investigation Area.

Defence will undertake further assessment to address important limitations in the current understanding of PFAS impacts arising from RAAF Base Williamtown within the NSW EPA investigation area. The outcomes of the Stage 2B Environmental Investigation and the HHRA will inform these further assessments and will also inform ongoing environmental monitoring and future management decisions in relation to PFAS on, or in the vicinity, RAAF Base Williamtown. The further assessments and ongoing monitoring programs of work will be developed in consultation with NSW EPA. Depending on the outcome of these additional investigations, it may be necessary to revise the HHRA to quantify changes to currently identified potential human health risks. HHRA will be updated, if required, based on changes in the regulatory environment (including the current review of the recent enHealth guidance).

Community engagement

Defence will continue to engage with the community about the environmental investigations and community information events.

Ecological Risk Assessment (ERA)

An ERA is being undertaken to assess the potential risk from identified PFAS impacts to ecological receptors with habitats present at the base and in the surrounding area. The ERA also considers the potential for wider ecosystem impacts to result from the accumulation of PFAS in terrestrial and aquatic organisms exposed to PFAS impacts. This assessment includes an ecological survey to identify potentially impacted plants, birds, fish and other animals, together with the analytical results of PFAS testing completed for the HHRA.

Water assistance

Defence continues to provide alternative sources of water to residents within the investigation area who rely on the use of a bore for drinking water. Defence will also provide water to residents if drinking water is sourced from a rainwater tank that contains, or has contained, bore water in the past. Residents should contact the Defence project team to discuss possible management strategies.

Defence is also providing \$3.5 million to Hunter Water Corporation to connect properties in the investigation area to mains water.

Keeping the community informed

Defence is committed to regularly updating the community throughout the investigation. Updates will be provided through the project website, community information sessions, direct mail and information sheets as new information becomes available. Enquiries or requests relating to individual properties will be considered on a case-by-case basis.

NSW Government agencies also have information which may be relevant:

- NSW EPA: 131 555
- NSW Health: 1300 066 055
- NSW Department of Primary Industries:
 - Fisheries closure: 4982 1232
 - Agriculture: 1800 808 095
- NSW Food Authority: 1300 552 406

The most up to date Investigation Area map can be accessed from NSW EPA website: <http://www.epa.nsw.gov.au/MediaInformation/williamtown.htm>

Defence attends all Community Reference Group meetings and minutes are published at: <http://www.epa.nsw.gov.au/mediainformation/community-reference-williamtown.htm>



Contact the project team

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