

I am aware that Ms [REDACTED], the person requesting the meeting in 1995, still works for JBTA. Perhaps DIRD should discuss historic engagement issues with [REDACTED] as she is likely to be the only person with the necessary corporate history. [REDACTED], the EPA's former representative, left the EPA a number of years ago.

Regards Mark

Mark Heckenberg | Manager, Contaminated Sites | Environmental Quality

Phone: 02 6207 2151 | Email: mark.heckenberg@act.gov.au

Construction, Environment and Workplace Protection | Access Canberra | ACT Government

GPO Box 158 Canberra ACT 2601 | <http://www.act.gov.au/accesscbr>

From: Kelly, Paul (Health)

Sent: Wednesday, 19 October 2016 9:34 AM

To: Heckenberg, Mark <Mark.Heckenberg@act.gov.au>; Rutledge, Geoffrey <Geoffrey.Rutledge@act.gov.au>

Cc: Pengilley, Andrew (Health) <Andrew.Pengilley@act.gov.au>; McNeill, Laura (Health)

<Laura.McNeill@act.gov.au>; Jones, Greg <Greg.Jones@act.gov.au>; Power, David <DAVID.POWER@act.gov.au>;

Chester, Heath <Heath.Chester@act.gov.au>; Gibb, Timothy <Timothy.Gibb@act.gov.au>

Subject: RE: t/c with DIRD, Defence, C'wealth Health on PFAS and JBT [SEC=UNCLASSIFIED]

Thanks Mark

Intriguing. It was DIRD who asked the question about permissions. This could become an issue and we need to be prepared to defend the process. Wreck Bay are the owners of the land which includes lower Mary Creek and permission to enter is theirs to give or with-hold. Of course, under the ACT Public Health Act at least, we could enter and sample if we truly believed that there was a public health hazard, regardless of permission. However, as discussed last week, I do not think that is warranted at this stage. Voluntary permission to enter is always, of course, preferable.

Is there anything documented from either DIRD or Wreck Bay? Even back to 1990s?

The crucial points which need to be "water tight" and seem to be that:

1. ACT EPA entry and testing of lower Mary Creek has been routine for the past 20 years
2. The Wreck Bay Community Council originally requested ACT EPA to undertake this task and are fully aware of this activity
3. PFAS was added at the request of DIRD to the two most recent rounds of testing this year

Please confirm this is correct Greg or Mark, and provide any documentary evidence of support.


Paul

Dr Paul Kelly

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From: Heckenberg, Mark
Sent: Wednesday, 19 October 2016 8:59 AM
To: Kelly, Paul (Health); Rutledge, Geoffrey
Cc: Pengilley, Andrew (Health); McNeill, Laura (Health); Jones, Greg; Power, David; Chester, Heath; Gibb, Timothy
Subject: RE: t/c with DIRD, Defence, C'wealth Health on PFAS and JBT [SEC=UNCLASSIFIED]

Hi Paul,

Thank you for the update.

To my knowledge the EPA has no current or historic formal agreement with the Wreck Bay Community to undertake sampling on their land, the only agreement/contractual arrangement the EPA has is with DIRD. Following a discussion on this matter with the EPA, Mr Greg Jones, he has recommended that we seek confirmation from DIRD or Defence that we (collectively) have explicit permission to enter Aboriginal land to undertake future sampling.

From a review of records and anecdotal information it is my understanding that in the late 1990s the Wreck Bay Community requested that the EPA undertake sampling of the lower Mary Creek area, as part of their broader environmental sampling in the JBT, to ascertain whether hydrocarbon or other impacts were coming from the RAN School of Ship Survivability and Safety. I further understand that the EPA's sampling was performed to verify the results of Defence sampling being undertaken at the RAN School of Ship Survivability and Safety due to reported incidents at the site because of the perceived 'mistrust' of Defence by Community at that time.

The extension of sampling to include PFAS was at the request of DIRD.

Regards

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From: Kelly, Paul (Health)
Sent: Tuesday, 18 October 2016 4:24 PM
To: Rutledge, Geoffrey <Geoffrey.Rutledge@act.gov.au>
Cc: Heckenberg, Mark <Mark.Heckenberg@act.gov.au>; Pengilley, Andrew (Health) <Andrew.Pengilley@act.gov.au>; McNeill, Laura (Health) <Laura.McNeill@act.gov.au>
Subject: t/c with DIRD, Defence, C'wealth Health on PFAS and JBT

Hi Geoffrey,

I just completed a teleconference with our friends. Defence wheeled out an Admiral!

Mostly a good meeting, and we have made good progress on how the community sessions will run and who will say what. My role will be confined to reiterating the negative potable water result from March, the rationale for the advice based on the EPA testing and what needs to happen next in terms of establishing the nature of any likely exposure pathway. DIRD will present the ACT EPA testing results, Defence will be responsible for discussing the contamination itself and plans for further investigation. Health rep (Cindy Toms) was less engaged, hadn't read the emails and were more reluctant to commit, the Deputy CMO did not attend. It was suggested by DIRD that they talk to PFAS and health risk and the national response including the enHealth guideline and subsequent external review.

One question that came up, and both DIRD and Defence are very sensitive about this, is access to Aboriginal land to conduct testing. A specific question to you Mark is: on what authority did ACT EPA perform the test on lower Mary Creek? My understanding (and I said this at the T/C but promised to seek confirmation and feed back) was that this

was part of routine environmental testing and that PFAS was added given that we had been informed of the potential contamination downstream from the Defence facility. Is there a legislative or contractual requirement which we can point to? If so, this would then be akin to fulfilling our obligation under the Public Health Act in relation to the potable water (though that is technically national park rather than community controlled Aboriginal land).

In response to my wish to visit and see the creek to give me some situational awareness (which is a pretty basic field epidemiology instinct I thought) DIRD have refused, citing similar concerns about permissions to enter Aboriginal land, which I can understand. I informed the meeting that I respect their view but that I therefore intend to raise this directly with the Chair of the Wreck Bay Community Council after the meeting – they may still refuse and I won't press it.

Regards,


paul

Dr Paul Kelly

ACT Chief Health Officer & Deputy Director-General |

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Stedman, Andrew (Health)

From: McNeill, Laura (Health) on behalf of Kelly, Paul (Health)
Sent: Tuesday, 25 October 2016 8:54 AM
To: McNeill, Laura (Health)
Subject: FW: Release of Defence PFAS Preliminary Sampling Program Report [SEC=UNOFFICIAL]
Attachments: 01 Preliminary Sampling Program Report - Main Report - Less Appendices.pdf; ATT00001.htm; 161021_Defence Letter to States and Territories_Release of PFAS PSP Report.pdf; ATT00002.htm
Importance: High

From: Walters, Daniel
Sent: Monday, 24 October 2016 3:38 PM
To: Jones, Greg; Heckenberg, Mark; Power, David; Chester, Heath; Dix, Rodney; Kelly, Paul (Health)
Cc: Martin, Kate (Health)
Subject: FW: Release of Defence PFAS Preliminary Sampling Program Report [SEC=UNOFFICIAL]
Importance: High

Dear All

FYI, release of Preliminary Report Defence for PFAS impacted sites which includes JB.

Regards

Daniel Walters

Senior Manager | Environment Protection Policy
 Environment and Planning Directorate | ACT Government

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🌐<http://www.environment.act.gov.au/>

🌱 Please consider our environment before printing this e-mail.

<https://www.yoursay.act.gov.au/urban-sounds>



From: [REDACTED]

To: [REDACTED]

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Subject: Release of Defence PFAS Preliminary Sampling Program Report [SEC=UNOFFICIAL]

UNOFFICIAL

UNOFFICIAL

UNOFFICIAL

Ladies and Gentlemen,

Please find attached a letter announcing the release of the per- and poly-fluoroalkyl substances (PFAS) preliminary sampling program report to the relevant State and Territory authorities.

Also attached is the main body of the Report. Due to file size, the site specific reports and factsheets will be released to you via the Govdex portal on Monday. Further details will be provided separately.

Please let me know if you have any queries or questions.

Regards,

[REDACTED]
Contractor to Defence
PFAS Site Environmental Investigations and Management
Department of Defence
[REDACTED] [REDACTED]

Brindabella Circuit
Brindabella Business Park
PO Box 7925 Canberra BC 2610

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Department of Defence
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PFASIMB-ID/OUT/2016/AF26968013

See distribution

RELEASE OF PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) PRELIMINARY SAMPLING PROGRAM REPORT

As you are aware, Defence is undertaking a national per- and poly-fluoroalkyl substances (PFAS) environmental investigation program to review its estate and manage the impacts of PFAS resulting from the historical use of legacy aqueous film forming foams (AFFF).

The current phase of detailed environmental investigations at RAAF Base Williamtown and Army Aviation Centre Oakey will be concluded by December 2016. Detailed environmental investigations are also underway at RAAF Base East Sale, RAAF Base Pearce and HMAS Albatross, and an investigation will commence at RAAF Base Edinburgh by the end of 2016.

During the period April-July 2016, Defence also undertook limited sampling of groundwater and/or surface water at a further 12 properties. The objective of the activity was to determine the presence of PFAS on, or in the vicinity of, the nominated Defence properties.

All 12 locations had positive detections for PFAS. As a result, detailed environmental investigations will be conducted at these properties. The schedule for the program of future investigations is currently being determined. At this stage I do not expect to be in a position to provide an update the schedule before 30 November 2016.

I have attached a copy of the preliminary sampling report for your information. Also attached are site-specific factsheets for the properties sampled.

The report will be publicly released, via Defence's national PFAS website, accompanied by the factsheets and FAQs. The proposed public release date is Monday 7 November 2016. We would like to include in the factsheets a reference to applicable state/territory government websites and the specific location of any PFAS-related advice. It would be appreciated if you could provide this information by **close of business Friday 28 October 2016**.

The public release of the preliminary sampling program report is a key step in progressing Defence's PFAS environmental management plan across its national estate. There is likely to be considerable media and public scrutiny of the preliminary sampling program report in terms of follow-up investigations by Defence and public health and ecological considerations.

I look forward to our staff working collaboratively together on this important issue. Any queries in relation to Defence's preliminary sampling program should be directed to Mr Danny Hetherington (mob: [REDACTED]; email: [REDACTED]@defence.gov.au).

Yours sincerely



Kim Arthur for

[REDACTED]
PFAS Investigation and Management Branch

21 October 2016

Appendices:

1. Defence PFAS Preliminary Sampling Program Report, dated September 2016
2. Site-specific Factsheets

Distribution:

Commonwealth Department of Infrastructure and Regional Development (Attention: [REDACTED], General Manager – Local Government, Mainland Territories and Regional Development Australia)

Qld Department of Premier and Cabinet (Attention: [REDACTED], Environmental Policy)

NSW Department of Premier and Cabinet (Attention: [REDACTED], [REDACTED] – Regional Coordination)

NSW EPA (Attention: [REDACTED] – Major Projects and PFAS Coordination)

Vic Department of Premier and Cabinet (Attention: [REDACTED] – Community Security and Emergency)

EPA Vic (Attention: [REDACTED]; [REDACTED] – Regional Services)

WA Department of Premier and Cabinet (Attention: [REDACTED] – Economic and Deregulation)

WA Department of Environment Regulation (Attention: [REDACTED] – Contaminated Sites)

NT Department of Trade, Business and Innovation (Attention: [REDACTED] – Strategic Defence Support)

NT EPA (Attention: [REDACTED] Pollution Control)

For information:

Great Barrier Reef Marine Park Authority (Attention: [REDACTED] – Biodiversity Conversation & Sustainable Use)



Jones Lang LaSalle

Defence per- and poly-fluoroalkyl Substances (PFAS) Environmental Management Preliminary Sampling Program Final Report

September 2016

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Appendices

Appendix A – Site Reports

Appendix B – QAQC Review

1. Introduction

GHD Pty Ltd (GHD) was engaged by Jones Lang LaSalle (ACT) Pty Ltd (JLL) on behalf of Department of Defence (Defence) to undertake preliminary sampling and analysis of environmental media to test for the presence of per- and poly-fluoroalkyl substances (PFAS) within on-site and off-site areas at a number of Defence properties (the investigation).

This report outlines the overall context, methodology and a summary of the findings of the investigation. More detailed standalone reports for each property are included in **Appendix A** and have been referred to throughout this report.

1.1 Background

Aqueous film-forming foams (AFFF) have been used for fire-fighting purposes around Australia for decades. AFFF products historically used on some Department of Defence (Defence) sites contained PFAS as active ingredients.

The historical use of AFFF has resulted in contamination of soil, groundwater, sediments and surface water at many locations where AFFF has been used or stored. While the risks to human health and the environment from PFAS are still the subject of much research, PFAS are highly persistent in the environment, can bio-accumulate, and may be harmful to animal and human health (US EPA, 2014).

Defence is in the process of investigating the potential for PFAS to be present on-site and off-site in groundwater, surface water, soil and sediments at a number of its properties. As part of this GHD has been engaged to undertake preliminary and limited investigations for PFAS in on-site and off-site areas at a number of sites for the purpose of assisting Defence in prioritising its program of future investigations.

Where applicable, the investigation was focussed on areas where groundwater may be abstracted for potable use, irrigation or livestock watering. It comprised a combination of on-site and off-site groundwater sampling of existing investigation and abstraction bores, and collection of surface water samples from drainage lines and tributaries at points of off-site discharge. A limited number of sediment samples were also collected at one property (RAAF Base Townsville).

This investigation is intended to be a snapshot of potential off-site presence of PFAS only, and should be regarded as a preceding step to any future PFAS investigations that would be conducted in accordance with the approaches specified by the National Environmental Protection (Assessment of Site Contamination) Measure (ASC NEPM).

1.2 Objective

The objective of the investigation was to test for the presence of PFAS in environmental media to provide an indication of the potential for PFAS to have migrated off-site via groundwater or surface water. This was to assist Defence to meet its objective to facilitate the early identification of potential exposure risks to off-site users of groundwater for the purpose of prioritising any future investigations.

1.3 Scope

The scope of the investigation comprised:

- Preparation of a Sampling & Analysis Quality Plan (SAQP) outlining the sampling & analysis scope, methodology and objectives for each property included in the investigation program.
- Identification and selection of sample locations based on Defence and publically available information including information contained within State groundwater databases.
- Sampling of selected or accessible on or off-site investigation and groundwater abstraction bores.
- Collection of surface water samples focused on drainage that has passed through or originated from the site.
- Collection of a limited number of sediment samples from one property (RAAF Base Townsville).
- Arrangements to obtain access and relevant permission from landowners and other relevant stakeholders to carry out sampling including:
 - Implementation of an off-site land access and consent process in accordance with Defence protocols
 - Liaison with Defence base services and environmental staff to arrange access to Defence land
- Laboratory analysis of samples for a suite of PFAS and other parameters.
- Evaluation and interpretation of the analytical results with respect to a set of screening levels specified by Defence for PFAS, and other Nationally applicable criteria for other parameters.

The properties included in the investigation are listed in Table 1.

Table 1 Subject sites

Defence Property	State
RAAF Base Townsville	Queensland
RAAF Base Amberley	Queensland
RAAF Base Richmond	New South Wales
Holsworthy Barracks	New South Wales
RAAF Base Wagga	New South Wales
HMAS Creswell Jervis Bay Range Facility	Australian Capital Territory
Albury Wodonga Military Area (Bandiana)	Victoria
HMAS Cerberus	Victoria
RAAF Base Edinburgh (see note 1. below)	South Australia
HMAS Stirling (Garden Island) (see note 2. below)	Western Australia
RAAF Base Tindal	Northern Territory
RAAF Base Darwin	Northern Territory
Robertson Barracks	Northern Territory

Properties that were not included in the investigation program from the originally planned program are listed below with a comment on how each was addressed:

1. *RAAF Base Edinburgh* – RAAF Base Edinburgh was originally included in the scope of works, however due to ongoing negotiations with Defence, SA EPA and Salisbury City Council, the site has been excluded from this report. This decision was directed by the Department of Defence.
2. *HMAS Stirling (Garden Island)*– HMAS Stirling is located on Garden Island in Western Australia, and was included in the preliminary investigation due to its historic use of AFFF. Due to the island's physical nature, no offsite groundwater sampling was possible. It was identified that an annual water quality monitoring project had already taken place at the site, and that the analysis included PFOS/PFOA for selected bores. As such, to avoid any duplication of efforts, the results from the existing water quality monitoring project have been used for this assessment. A report providing a review of relevant data for HMAS Stirling (Garden Island) is provided in **Appendix A**.

1.4 Limitations

This report has been prepared by GHD for Jones Lang LaSalle and Department of Defence and may only be used and relied on by Jones Lang LaSalle and Department of Defence for the purpose agreed between GHD and Jones Lang LaSalle and Department of Defence as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Jones Lang LaSalle and Department of Defence arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD listed in Section 1.5 and contained throughout this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Jones Lang LaSalle and Department of Defence and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

Site conditions (including the presence of hazardous substances and/or site contamination) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change.

1.5 Assumptions

Being preliminary in nature, the investigation outcomes are necessarily subject to a number of limitations which are contained throughout the report. The key assumptions are listed below:

- As the investigation is intended to precede any subsequent preliminary and detailed investigation that would be in accordance with the ASC NEPM, no conceptual site model has been used as a basis for design of the sampling and analysis plans for the investigation.
- Groundwater sample locations have been limited to existing investigation and abstraction bores and therefore:
 - The groundwater sampling locations were selected on the basis of accessibility and a limited understanding of site and regional geology, hydrogeology and hydrology, and potential sources of PFAS.
 - Information on the construction and condition of groundwater investigation and abstraction bores was limited to information contained in the State groundwater databases, therefore the suitability of the groundwater bore for providing a representative sample of surrounding aquifer conditions cannot be confirmed.
- Sampling has been conducted at each location once, and as such the results of the investigation represent a snapshot at one particular time and do not take into account possible seasonal variations.
- While consideration has been given to possible on-site sources of PFAS and the sampling plan designed accordingly, no site history or other information has been considered in relation to other potential contaminants of concern.
- The investigation is focused on early identification of potential impacts to off-site users of groundwater rather than potential ecological impacts or impacts to human health arising from presence of contaminants in surface water .

2. Project Data Quality Objectives

In accordance with the ASC NEPM a set of data quality objectives (DQO) was developed for the investigation. The DQOs were used to define the criteria for the sampling and analysis for each property. The outcome of this process is outlined below:

- **Step 1 - State the problem to be resolved**

What is (a) the likelihood that PFAS has migrated off-site via groundwater or surface water and (b) the potential risk of this to off-site users of groundwater?

- **Step 2 - Identify the decision/s to be made**

To address the problem defined in Step 1, the following decisions are required to achieve the task objective and to identify data gaps and additional information that may be required:

- Do the concentrations of PFAS in the samples collected exceed the relevant adopted Tier 1 criteria including Defence Contamination Directive Number 8?
- Do the results of the groundwater and surface water sampling and analysis indicate that PFAS has migrated off-site, or has the potential to migrate off site?

- **Step 3 - Identify the inputs to the decision**

To inform the decisions and identify key data gaps and needs, the following information is considered necessary:

- The nature and location of existing on-site and off-site groundwater bores with respect to potential PFAS sources
- Inferred groundwater and surface water flow pathways
- The results of the laboratory analysis of samples
- The nature of the aquifer and its relevant environmental values or suitability for use

- **Step 4 - Define the boundaries of the study**

The study area boundaries comprise the areas in the vicinity of sample locations at each site, and generally:

- The upper aquifer in the vicinity of groundwater sample locations
- Surface water pathways and receiving environments in the vicinity of surface water sample locations

- **Step 5 - Develop a decision rule**

The key decision rule is: do the concentrations of PFAS in samples exceed the adopted Tier 1 criteria including Defence Contamination Directive Number 8?

- If NO – groundwater and surface water off-site is less likely to be contaminated and the priority for further off-site investigations at the site may be reduced
- If YES – groundwater and surface water off-site is more likely to be contaminated and the priority for further off-site investigations is increased

- **Step 6 - Specify the tolerable limits on decision errors**

A detailed assessment of potential for sampling and measurement errors will be undertaken based on investigation scope, methodology and results. Data quality will be assessed as detailed in Schedules B2 and B3 of the ASC NEPM. Implications for data quality with respect to the task objective will be identified and discussed.

Due to the margin of error associated with analytical methods, any results close to the threshold (within the margin of error either over or under) are more likely to be incorrectly considered either "contaminated" or "uncontaminated".

As targeted samples are to be collected as part of a judgemental approach, greater confidence in results will be achieved through knowledge of the site and the likely location of PFAS sources. As such, the following tolerable limits on decision making are proposed for targeted sampling locations:

- For results within the margin of error (either above or below the threshold) the initial classification would be considered valid (unless for a chemical not considered to be a contaminant of potential concern).
- Any results above the threshold would require further investigation and delineation to determine the size of the impact identified.

- **Step 7 - Optimise the design for obtaining the data**

The sample design will be optimised through:

- Identification to the extent possible of potential PFAS sources from existing information and investigations conducted by others
- A preliminary and high level review of the likely hydraulic characteristics of the upper aquifer to estimate the groundwater flow direction at various locations of the site
- Identification of the key surface water pathways over and from the site, and with respect to potential PFAS source areas
- Application of an appropriate rationale for selection of off-site groundwater sample locations
- Appropriate laboratory analysis methodologies
- Evaluation and interpretation of results with respect to relevant Tier 1 criteria including Defence Contamination Directive Number 8

3. Methodology

3.1 Rationale for selection of sample locations

3.1.1 Groundwater sample locations (off-site)

Following a review of existing Defence information and searches of publically available information contained in the State groundwater databases, bores were selected for sampling on the basis of the following:

- Proximity to the Defence property boundary - bores closer in proximity were favoured.
- Hydraulic direction from the Defence property and PFAS sources on site where known and as established from reviews conducted in accordance with Step 2 of Section 2 (Data Quality Objectives) - bores hydraulically down-gradient were favoured.
- Screen depth - shallower depths were favoured, screening depths of less than 30 m were targeted where possible, and generally bores with depths greater than 80 m depth were excluded - unless no other options were available.

The selection process then considered the following secondary factors:

- Licence status (if available) – bores with licence status listed as existing, operational, current (or similar), “cancelled but still useable” and investigation or monitoring bores were prioritised. Bores listed with licence status cancelled or lapsed were considered where additional spatial coverage was needed. Bores listed as abandoned, destroyed, backfilled (or similar) were excluded.
- Bore owner – priority for government owned bores to minimise stakeholder engagement requirements. It is noted however that this information did not appear to be reliable in the groundwater databases for some areas (e.g. RAAF Base Richmond, bores identified as owned by Federal Government were later found to be on private property based on searches of the property titles).
- Apparent quality of data – bores with more complete information included in the database were preferred and those with missing, minimal or conflicting information were excluded.
- Clusters of bores – where there were multiple bores or groups of bores in a cluster, only a limited number of bores were selected as being representative of the group. For some sites where it was considered that sampling of additional bores on the same property would not provide significant additional information, less than 10 bores were proposed for sampling. For other sites, sampling of less than 10 bores was completed due to the limited number of existing accessible bores.
- Defence preferences for site access – locations with minimal potential access restrictions selected by Defence.

3.1.2 Groundwater sample location (on-site)

Where numbers or geographical coverage of off-site bores was not sufficient to meet the project objectives, near boundary on-site monitoring wells were selected for sampling. The selection of on-site wells has been biased to near boundary wells located down-gradient of potential PFAS source areas.

3.1.3 Surface water sample locations

Surface water / stormwater sampling locations were selected with the aim of identifying areas of potential or likely runoff from PFAS sources present on site that may cause offsite impacts to off-site groundwater. Movement of PFAS through surface water followed by subsequent recharge to groundwater at some distance from a source area has been shown to be an important contaminant migration mechanism for PFAS at other sites.

The selection of sample locations was based on available desktop information which was reviewed in accordance with Step 2 of Section 2 (Data Quality Objectives). Site-setting and hydrological information for each site was reviewed in order to identify:

- Likely direction of surface drainage from potential PFAS sources, based on topography
- Drainage lines originating from or crossing through the site that were likely to receive drainage from potential PFAS sources
- Drainage lines connecting with offsite surface water bodies
- Accessibility for the purposes of sampling (e.g. proximity to roads and access paths)

Using this information, locations have been selected on or surrounding each property for collection of surface water grab samples.

3.1.4 Sediment sample locations – RAAF Base Townsville only

At RAAF Base Townsville, sediment samples were also collected at the surface water sample locations based on the same rationale outlined in Section 3.1.3. Townsville was the first to be sampled in the overall program, and this occurred prior to a decision to remove sediment sampling from the program as it was not in line with project objectives.

3.2 Property access

3.2.1 Property access process

The management of access to private properties for the purpose of the investigation was underpinned by the principles of open and clear communication with Defence, landowners and GHD sampling personnel, as well as accurate record keeping and proactive management of issues as they arose. The process for obtaining property access was as follows:

1. Properties requiring access were identified as per the process outlined in Section 3.1.
2. Where access was required to Defence sites, the GHD local site team representative liaised with local base representatives to made arrangements.
3. Where access was required to non-Defence sites, GHD (in conjunction with relevant Defence representatives) determined land ownership and prepared information packages that were sent to the Senior Australian Defence Force Officer (SADFO) for each property. The SADFO then made contact with the landowners in the first instance, providing a copy of the letter, property access consent form and fact sheet. The SADFO encouraged landowners to complete the consent form and arrange for it to be returned to GHD.
4. Following approval from the SADFO at each Defence property, GHD then made contact with the landowners via telephone to determine if there were any specific arrangements with regard to providing notification prior to access being required, also to encourage landowners to return the relevant consent forms if they have not already done so. If a landowner did not wish to provide access to the property, GHD recorded any reasons for the objection and flagged this in 'Consultation Manager' for notification to the Defence project manager.

5. All information from landowners was logged in Consultation Manager and notes of agreed notification periods and conditions of entering each off-site property made.
6. GHD's property access team provided consolidated property information to local site teams as well as briefings on specific access arrangements. Local site teams were also briefed on site protocols.
7. The sampling teams confirmed dates for accessing properties for the purposes of sampling and the stakeholder team subsequently contacted landowners within agreed timeframes and communication channels.
8. Following access by the sampling teams, GHD land access personnel updated Consultation Manager with any new information obtained.
9. Following the completion of sampling, either the stakeholder team or the SADFO for each property then made contact with landowners to thank them for their cooperation and follow up on any questions.

3.2.2 Property access protocols

All site staff were briefed on appropriate messaging and community relations procedures prior to accessing any off-site properties. All staff adhered to the Australian Public Service Code of Conduct, as well as the following protocols:

- Avoidance of unnecessary disturbance to site occupants or interference with the convenience of the public (including access to, use and occupation of private or public roads and footpaths).
- Compliance with all relevant Commonwealth, State or Territory Work Health and Safety requirements, including assessing the work health and safety implications of the work to be performed and implementation of a system that identified and managed work health and safety risks.
- When accessing properties, site teams made contact with landowners when they arrived at the respective property to inform them of work commencing, and to inform them once work had been completed.
- Site staff did not attempt to answer any questions related to the project outside of the scope of activities they were completing on the day. Staff provided landowners with an information card that included the project 1800 number and email address and asked them to contact the Stakeholder Engagement Manager on 1800 987 618 to discuss any questions they may have.

3.2.3 Provision of results to private landowners

The private landowners of properties that were accessed for the purposes of sampling will be notified individually by Defence of the results.

3.3 Sample methodology

The sampling methodology was in accordance with:

- ASC NEPM (as amended in 2013) Schedule B(2) Guideline on Site Characterisation (ASC NEPM)
- WA Department of Environment Regulation, Interim Guidelines on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), Contaminated Sites Guidelines (DER, 2016)¹

3.3.1 Groundwater

The following methodology was adopted for the collection of groundwater samples:

- The well that was intended for sampling was positively identified and any ambiguity was resolved before proceeding. Where contaminated groundwater was suspected, wells with the least potential to be contaminated were sampled first to minimise the risk of cross contamination between samples.
- Where bore headworks were suitable, the depth to groundwater in the well was measured by the use of an interface probe. Prior to measuring, the bore cap was first removed and the well head level allowed to stabilise before measurements were made. Depth measurements were referenced to the top of well casing as an established datum. Where possible, depth measurements were recorded to the nearest 1 mm. Repeat measurements were made at subsequent time intervals to ensure equilibrium had been attained. Any field note regarding odour or other observations was recorded. Where possible, total well depth and the height difference between the well head and the ground level was also recorded.
- Groundwater samples were collected using the following methods:
 - For abstraction bores containing operational fixed down-hole pumping infrastructure and headworks, samples were collected directly from bore-head taps.
 - For bores without downhole pumping infrastructure, and where the sample depth exceeded the limits of pumping for a peristaltic pump (approximately 8 m depth), a disposable bailer was used.
 - For on-site bores at RAAF Base Townsville, low flow groundwater sampling methodologies were used.
- To reduce the quantity of (potentially contaminated) purge water produced, for bores sampled using a bailer, a volume of approximately five litres of water was purged from each bore prior to collection of a sample. This was considered appropriate given PFAS are not affected by volatilisation, stagnation or oxidation, which are the key drivers for purging.
- Field parameters (pH, EC, DO, temperature and redox potential) were measured from the purged volume prior to sample collection.

¹ Relevant due to its specific applicability to the assessment of PFAS, and in the absence of other similar National or State specific guidance. (Note: Not applied to RAAF Base Townsville as sampling at that site was conducted prior to the decision being made to adopt this guidance. Instead, EPA Victoria Publication 668 Hydrogeological Assessments (Groundwater Quality) Guidelines 2006 was adopted for RAAF Base Townsville which is applicable to Federal land and jurisdictions outside Victoria).

- The decontamination process for the interface meter comprised cleaning with Decon 90, a single rinse with tap water, followed by a triple rinse with de-ionised water using a spray bottle.
- Low yielding wells that were purged dry were left to recover. Following recovery of groundwater levels in the well, sampling proceeded on the assumption that the groundwater represents inflow from the hydrostratigraphic unit screened by the well. In this instance, measurement of stabilisation parameters proceeded as per the specified procedure to provide a cross check and ensure representative formation water was being collected.
- Potentially contaminated purge water was collected and stored at an appropriate location on-site in consultation with the Regional Environmental & Sustainability Officer (RESO). Upon receipt of the analytical results, GHD arranged for the purge water to be disposed of appropriately by a liquid waste contractor licenced to receive the type of waste.

3.3.2 Surface water

Surface water samples were collected directly from the water body from the embankment using a long handled sampler, and were decanted directly to laboratory prepared sample bottles. Field parameters (pH, EC, DO, temperature and redox potential) were measured at the time of sampling using a calibrated water quality meter. A GPS location and sample depth were recorded at each surface water sample location. Note that all samples were collected at surface and therefore no depth measurements are provided in this report.

3.3.3 Sediment

As discussed in Section 3.1.4, sediment samples were also collected at the surface water sample locations at RAAF Base Townsville. Samples were collected by the use of a sediment grab sampler and placed immediately into Teflon free laboratory prepared jars.

3.3.4 Sample handling and field QA/QC

Once collected, samples of all media were labelled and stored in ice chilled cooler boxes. Samples were stored out of direct sunlight. Samples were dispatched to the primary and secondary laboratories under Chain of Custody (COC) documentation. Verified copies of the chain of custody were retained.

Potential sources of false positive PFAS detections were minimised through adoption of the recommended mitigation practices and alternative products and practices outlined in DER 2016. The exception to this was the use of a detergent (Decon 90) to decontaminate the interface probe as discussed above.

Quality Control and Quality Assurance samples were analysed for PFAS at the following rates: (a) Intra-laboratory duplicates - one secondary sample for each 10 primary samples, (b) Inter-laboratory duplicates - one secondary sample for each 10 primary samples, and (c) Trip blank and rinsate blank samples - one of each per base. The rinsate blank samples were used to assess any potential cross contamination from the only piece of equipment that will be reused in each bore which was the interface meter.

3.4 Laboratory analysis

Groundwater, surface water and sediment samples were analysed at three National Association of Testing Authorities (NATA) accredited commercial laboratories as follows:

- ALS Environmental – analysis of all primary samples
- SGS – analysis of secondary samples for RAAF Base Townsville

- MGT Eurofins – analysis of all other secondary samples

Primary and secondary samples were analysed for the parameters shown below in Table 2.

Table 2 Analytical schedule

Media	Parameter	Rationale
Primary samples		
Groundwater and surface water	PFAS 20 parameter suite ¹	<ul style="list-style-type: none"> • Contaminants of potential concern
	NEPM heavy metal suite (As, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Mn, V, Zn, Hg)	<ul style="list-style-type: none"> • Opportunistic and value for money consideration to Defence • Potential contaminants of concern at some locations
	Major ions	<ul style="list-style-type: none"> • Identification of water type • To distinguish between water bodies and make assumptions regarding mixing
	Total dissolved solids	<ul style="list-style-type: none"> • Water type indicator • PFAS fate and transport indicator
	TRH and BTEXN	<ul style="list-style-type: none"> • Contaminants of potential concern for Fire Training Grounds
Sediment samples (RAAF Base Townsville only)	PFAS 20 parameter suite ¹	<ul style="list-style-type: none"> • Contaminants of potential concern
	NEPM heavy metal suite (As, Ba, Be, Cd, Cr, Co, Cu, Pb, Ni, Mn, V, Zn, Hg)	<ul style="list-style-type: none"> • Opportunistic and value for money consideration to Defence • Potential contaminants of concern at some locations
	Total organic carbon	<ul style="list-style-type: none"> • PFAS fate and transport indicator
Blind and split duplicate (secondary) samples		
All media	PFAS 4 parameter suite ²	<ul style="list-style-type: none"> • Key contaminants of potential concern
Rinsate and trip blank samples		
Deionised water	PFAS 4 parameter suite ²	<ul style="list-style-type: none"> • Key contaminants of potential concern

1. **PFAS 20 parameter suite:** Perfluorooctane sulfonate (PFOS), Perfluorooctanoic acid (PFOA), 6:2 Fluorotelomer sulphonate (6:2 FTS), 8:2 Fluorotelomer sulphonate (8:2 FTS), N-Ethyl-heptadecafluorooctane sulphonamide (N-Et-FOSA), N-Ethyl-heptadecafluorooctane sulphonamidoethanol (N-Et-FOSE), N-Methyl-heptadecafluorooctane sulphonamide (N-Me-FOSA), N-Methyl-heptadecafluorooctane sulphonamidoethanol (N-Me-FOSE), Perfluorobutane Sulfonate (PFBS), Perfluorodecane Sulfonate (PFDcs), Perfluorodecanoic Acid (PFDcA), Perfluorododecanoic Acid (PFDoA), Perfluoroheptanoic Acid (PFHpA), Perfluorohexane Sulfonate (PFHxS), Perfluorohexanoic Acid (PFHxA), Perfluorononanoic Acid (PFNA), Perfluorooctane Sulphonamide (PFOSA), Perfluorotridecanoic acid (PFTnA), Perfluorotetradecanoic acid (PFTeA), Perfluoroundecanoic Acid (PFUnA)
2. **PFAS 4 parameter suite:** Perfluorooctane sulfonate (PFOS), Perfluorooctanoic acid (PFOA), 6:2 Fluorotelomer sulphonate (6:2 FTS), 8:2 Fluorotelomer sulphonate (8:2 FTS)

3.5 Sample locations

Details of the nature and number of sample locations for each property are contained in Table 3. This includes information on *proposed* and *actual* sample locations.

Available bore construction details for *actual* sample locations, from the publicly available groundwater databases in each state are presented in Table 3. No surveyed levels were available for bores sampled and therefore have not been included in this report.

Due to the inherent uncertainty associated with accessing bores owned by others at locations on private property, a large number of bores that were identified for sampling could not be sampled as a result of them being (a) un-locatable and presumed destroyed, or (b) locatable but unsuitable for sampling due to their condition. Where this was the case, every effort was made to locate an alternative location for sampling to bridge the data-gap. In addition, some of the proposed surface water sample locations needed to be moved due to physical access constraints that were identified at the time of sampling.

Proposed and *actual* sample location plans are included in the standalone property reports included in **Appendix A**.

To protect the privacy of landowners who granted access to their properties for the purposes of this project, no site addresses, names or co-ordinates are presented in this report.

Table 3 Sample location details

Site	Sampling Location	Comment
RAAF Base Townsville ¹		
Onsite	RAAFTVL 49	Sampled, as per SAQP
Onsite	RAAFTVL 04	Sampled, as per SAQP
Onsite	RAAFTVL26	Sampled, as per SAQP
Onsite	RAAFTVL33	Sampled, as per SAQP
Onsite	RAAFTVL02	Sampled, as per SAQP
Onsite	RAAFTVL102	Sampled, as per SAQP
Onsite	RAAFTVL57	Sampled, as per SAQP
Onsite	RAAFTVL43	Sampled, as per SAQP
Onsite	RAAFTVL09	Sampled, as per SAQP
Onsite	RAAFTVL114	Sampled, as per SAQP
Onsite	SS01	Sampled, as per SAQP
Onsite	SS02	Sampled, as per SAQP
Onsite	SS03	Sampled, as per SAQP
	RAAFTV100	Not sampled: destroyed.
	RAAFTVL118	Not sampled: replaced with RAAFTVL02 as per sampling plan

Site	Sampling Location	Comment
RAAF Base Amberley		
Onsite	154503	Sampled, as per SAQP
Offsite	154522	Sampled, as per SAQP
Offsite	14310188	Sampled, as per SAQP
Onsite	154505	Sampled, as per SAQP
Offsite	SW001	Sampled, as per SAQP
Onsite	SW002	Sampled, as per SAQP
Offsite	SW003	Sampled, as per SAQP
Offsite	SW004	Sampled, as per SAQP
Offsite (Private land)	154495	Sampled: additional groundwater pump on the site that was accessible
Offsite	14310091	Sampled: additional groundwater bore on the site that was accessible
	14310102	Not sampled: blocked unable to bail.
	9999999	Not sampled: broken
	154405	Not sampled, 154495 substituted.
RAAF Base Richmond ²		
Offsite	RCH_SW001	Sampled, as per SAQP
Offsite	RCH_SW002	Sampled, as per SAQP
Offsite	RCH_SW004	Sampled, as per SAQP
Offsite	RCH_SW005	Sampled, as per SAQP. Irrigation channel fed by groundwater bore. No flow due to no wind.
Offsite	RCH_GW001	Sampled: new groundwater bore on the site that was accessible.
Offsite	RCH_SW006	Surface sample collected instead of groundwater sample as groundwater well was not able to be located.
Offsite	RCH_SW007	Surface sample collected instead of groundwater sample as groundwater well was not able to be located. Sample retrieved from surface water dam, landowner believes it is spring fed.
Offsite	RCH_SW008	Surface sample collected instead of groundwater sample as groundwater well was not able to be located. Sampled irrigation channel proximal to a creek, landowner believes the channel might be spring fed.
Offsite	RCH_SW009	Surface sample collected instead of groundwater sample as groundwater well was not able to be located. Sampled creek/irrigation channel, not impacted by bore water flows through property.
Offsite (Private land)	RCH_GW059155	Sampled: moved on the map to correct location based on field observations.
Offsite	RCH_SW003	Sampled: moved downstream to a safer more accessible area of the creek.
Offsite	GW108009	Not sampled: unable to locate

Site	Sampling Location	Comment
Offsite (Private land)	GW032344	Not sampled: bore encased by windmill used to pump groundwater, wind was not sufficient to draw water and as bore was encased by windmill this bore could not be sampled.
Offsite (Private land)	GW032012	Not sampled: unable to locate
Offsite (Private land)	GW032352	Not sampled: unable to locate
Offsite (Private land)	GW032349	Not sampled: unable to locate
Offsite (Private land)	GW18612	Not sampled: unable to locate
	GW068164	Removed from program, not required by Defence
	GW023098	Removed from program, not required by Defence
	GW022696	Removed from program, landowner not aware of bore.
Holsworthy Barracks³		
Offsite	HBK_SW001	Sampled, as per SAQP
Offsite	HBK_SW003	Sampled, as per SAQP
Onsite	HBK_SW005	Sampled surface water instead of GW1000098, as bore could not be found
Offsite	HBK_SW004	Sampled: moved slightly downstream to safely access site
Offsite	HBK_SW002	Sampled: moved downstream due to restricted site access
	GW100098	Not sampled: unable to locate well, HBK_SW005 sampled instead
	GW108802	Removed from program, not required by Defence.
	GW100098	Removed from program, not required by Defence.
	GW107018	Removed from program, not required by Defence.
	GW107001	Removed from program. Located across major river from site.
RAAF Base Wagga		
Offsite	GW030714	Sampled, as per SAQP
Offsite	GW047279	Sampled, as per SAQP
Offsite	GW047281	Sampled, as per SAQP
Offsite	WAG_SW001	Sampled, as per SAQP
Offsite	WAG_SW002	Sampled, as per SAQP
	WAG_SW003	Not sampled: no water, vegetated
	GW14536 (Bore 1)	Not sampled: unable to locate
	GW05641	Not sampled: permission not granted
	GW028842	Removed from program, not required by Defence.
	GW014506	Removed from program, not required by Defence.

Site	Sampling Location	Comment
HMAS Creswell Jervis Bay Range Facility		
Offsite – HMAS Creswell	CR_MW1	Sampled, as per SAQP
Offsite – HMAS Creswell	CR_MW2	Sampled, as per SAQP
Onsite	JB_MW09	Sampled, as per SAQP
Onsite	JB_SS1	Sampled, as per SAQP
Onsite	JB_SS2	Sampled, additional location based on site personnel advice
Onsite	JB_SS3	Sampled, as per SAQP
Onsite	JB_MW07	Sampled, as per SAQP.
Offsite	JB_SS4	Not sampled: access not granted to offsite locations within project timeframes
Offsite	JB_SS5	Not sampled: access not granted to offsite locations within project timeframes
Albury Wodonga Military Area (Bandiana)⁵		
Offsite	BMA_4156814	Sampled, as per SAQP
Onsite	BMA_MW02	Sampled, as per SAQP
Onsite	BMA_MW03	Sampled, as per SAQP
Onsite	BMA_MW04	Sampled, as per SAQP
Offsite	BMA_MW06	Sampled, as per SAQP
Offsite	BMA_SW001	Sampled, as per SAQP
Offsite	BMA_SW002	Sampled, as per SAQP
Offsite	BMA_SW003	Sampled, as per SAQP
	BMA_MW06	Not sampled: bore effectively dry
	419410	Removed from program, landowner not aware of bore.
	4126891	Removed from program, landowner not aware of bore.
	4003338	Removed from program, not required by Defence.
	4131977	Removed from program, not required by Defence.
	4078900	Removed from program, not required by Defence.
HMAS Cerberus ⁶		
Offsite (Private land)	CER_40811469	Sampled, as per SAQP
Offsite	CER_SW01	Sampled, as per SAQP
Offsite	CER_SW02	Sampled, as per SAQP
Offsite	CER_SW03	Sampled, as per SAQP
	4081488	Removed from program, not required by Defence.

Site	Sampling Location	Comment
	4081429	Removed from program, not required by Defence.
	4155289	Removed from program, not required by Defence.
RAAF Base Tindal ⁷		
Offsite (Private land)	RN027754	Sampled, as per SAQP
Offsite (Private land)	RN037695	Sampled, as per SAQP
Offsite (Private land)	RN027104	Sampled, as per SAQP
Offsite (Private land)	RN035469	Sampled, as per SAQP
Offsite (Private land)	RN037432	Sampled, as per SAQP
Offsite (Private land)	RN037535	Sampled, as per SAQP
Offsite (Private land)	RN031332	Sampled, as per SAQP
Offsite	TIN_SW001	Sampled, as per SAQP
Offsite	TIN_SW002	Sampled, as per SAQP
Offsite	TIN_SW003	Not sampled: location dry
Offsite	RN024309	Not sampled: permission not granted
Offsite	RN004278	Not sampled: unable to locate well
Offsite	RN006238	Not sampled: unable to locate well
RAAF Base Darwin ⁸		
Offsite	DRW SW01	Sampled, as per SAQP
Offsite	DRW SW02	Sampled, as per SAQP
Offsite	DRW SW03	Sampled, as per SAQP
	RN008307	Not sampled: inspected the site and could not locate bore. Land holders were not aware of a bore on the property.
	RN000216	Not sampled: inspected the site and could not locate bore. Land holders were not aware of a bore on the property.
	RN000274	Not sampled: inspected the site and could not locate bore. Land holders were not aware of a bore on the property.
	RN005310	Not sampled: permission not granted
	RN001780	Not sampled: permission not granted
	RN001754	Not sampled: inspected the site and could not locate bore. Land holders were not aware of a bore on the property.
	RN020328	Not sampled: inspected the site and could not locate bore. A creek runs through the property (public recreational park) and various water features were identified, however a production bore was not located.
	RN000789	Removed from program, not required by Defence.

Site	Sampling Location	Comment
	RN020824	Removed from program, not required by Defence.
	RN033344	Removed from program, not required by Defence.
	RN001932	Removed from program, not required by Defence.
	RN023380	Removed from program, not required by Defence.
	RN028668	Removed from program, not required by Defence.
Robertson Barracks ⁹		
Offsite (Private land)	RN034545	Sampled, as per SAQP
Onsite	MTR Bore	Sampled, as per SAQP
Offsite (Private land)	RN038560	Sampled, as per SAQP
Offsite (Private land)	RN003795	Sampled, as per SAQP
Offsite	ROB SW01	Sampled, as per SAQP
	MTR Blue Standpipe	Not sampled: site abandoned - root impact at 28 m, persisted with various slugs for half hour
	RN006199	Not sampled: unable to locate, bore log states no casing, no screens. On the advice of NT Water Group (Gov), did not pursue further than initial site inspection.
	RN032254	Not sampled: located, unable to sample as cut off at ground and concreted over
	RN008613	Not sampled: unable to locate, bore log states investigation bore. On the advice of NT Water Group (Gov), did not pursue further than initial site inspection.
	RN008618	Not sampled: unable to locate, inspected the site and could not locate the bore. On the advice of NT Water Group (Gov), did not pursue further than initial site inspection.
	RN008085	Not sampled: unable to locate, inspected the site and could not locate the bore. On the advice of NT Water Group (Gov), did not pursue further than initial site inspection.
	RN002291	Not sampled: unable to locate, inspected the site and could not locate bore. Land holders were not aware of a second bore on the property.
	SW02	Not sampled: dry stormwater drain
	SW03	Not sampled: dry stormwater drain

Notes:

- RAAF Base Townsville** –All groundwater sample locations on-site due to absence of suitable off-site bores for sampling - desktop and groundwater database reviews suggest low potential for groundwater abstraction off-site. Surface water samples retrieved at the site boundaries, surface sample SS03 retrieved from defence owned land, outside of site boundary.
- RAAF Base Richmond** – Additional surface water samples collected to the north of the site in place of planned groundwater samples for bores that were not located or known by the landowner. Repeat attempts to access site occurred due to wet weather and waterlogged conditions. Landowner suggested potential presence of shallow groundwater at the site, indicating that groundwater flow is most likely mechanism for transport of contaminants. Majority of identified bores to the north of the site were not located. However, one windmill bore was in use feeding adjacent irrigation channel. To the south of the site one newly installed groundwater bore (showgrounds/horticultural society) was included in the investigation program; new installation indicating likely use of groundwater for irrigation.

3. **Holsworthy Barracks**- No on or off-site groundwater sample locations due to absence of suitable bores - desktop and groundwater database reviews suggest low potential for groundwater abstraction off-site. On-site and off-site surface water samples retrieved from tributaries leading from potential PFAS sources.
4. **HMAS Creswell Jervis Bay Range Facility** – Lack of identified offsite groundwater bores indicated use of groundwater in the vicinity of the site is unlikely. Surface water samples retrieved at the site boundaries and likely headwaters of creek drainage to offsite areas south of the site. Surface water runoff most likely pathway for transport and exposure to contaminants sourced from the site.
5. **Albury Wodonga Military Area (Bandiana)**– All groundwater sample locations on-site due to absence of suitable off-site bores for sampling - desktop and groundwater database reviews suggest low potential for groundwater abstraction off-site. Surface water samples retrieved at the site boundaries.
6. **HMAS Cerberus** – Site located adjacent to the ocean. Based on the topography, hydrology and location of potential PFAS sources the key potential contaminant migration pathway for the site is via surface water to the marine environment, which has been covered by the surface water sampling program.
7. **RAAF Base Tindal** – availability of offsite groundwater bores to the north and northwest of the site only. Lack of bores installed in other directions around the site indicates use of groundwater likely only to the north and northwest. Surface water drainage also a potential pathway.
8. **RAAF Base Darwin** - No off-site groundwater sample locations due to absence of suitable off-site bores - desktop and groundwater database reviews suggest low potential for groundwater abstraction off-site. Surface water samples retrieved at the site boundaries. Routine monitoring for PFAS recently conducted at on-site bores and reported separately.
9. **Robertson Barracks** – Only three groundwater sample locations sampled off-site due to absence of other suitable off-site bores for sampling - desktop and groundwater database reviews suggest low potential for groundwater abstraction in the immediate vicinity of the site. One surface water sample retrieved only due to dry conditions at the time of sampling. Routine monitoring for PFAS recently conducted at on-site bores and reported separately.

Table 4 Available bore construction and use details for sampled bores

Bore ID	Licence Status	Purpose / Use ¹	Depth	SWL	Lithology
RAAF Base Townsville					
RAAFTVL 49		N/A - see Table 7 for field measurements			
RAAFTVL 04		N/A - see Table 7 for field measurements			
RAAFTVL26		N/A - see Table 7 for field measurements			
RAAFTVL33		N/A - see Table 7 for field measurements			
RAAFTVL02		N/A - see Table 7 for field measurements			
RAAFTVL102		N/A - see Table 7 for field measurements			
RAAFTVL57		N/A - see Table 7 for field measurements			
RAAFTVL43		N/A - see Table 7 for field measurements			
RAAFTVL09		N/A - see Table 7 for field measurements			
RAAFTVL114		N/A - see Table 7 for field measurements			
RAAF Base Amberley					
154503	Existing	Sub-artesian Monitoring	-	-	-
154522	Existing	Sub-artesian Monitoring	-	-	-
154495	Existing	Sub-artesian Monitoring	-	9.5	-
14310188	Existing	Sub-artesian Monitoring	-	21.6 8	-
154505	Existing	Sub-artesian Monitoring	-	-	-
14310096		No details available - see Table 7 for field measurements			
14310091		No details available - see Table 7 for field measurements			
14310102	Existing	N/A	-	13.3 8	-
RAAF Base Richmond					
RCH_GW059155	Lapsed	Irrigation	15	-	-
RCH_GW001		No details available - newly installed			
Holsworthy Barracks					
NA - no bores sampled					
RAAF Base Wagga					
WAG_GW030714	Converted	Town Water	50	36	-
Bore 5, GW047279	Converted	Town Water	56.4	-	-
WAG_GW047281	Converted	Town Water	49.7	11	
HMAS Creswell Jarvis Bay Range Facility					
CR_MW1		N/A - see Table 7 for field measurements			
CR_MW2		N/A - see Table 7 for field measurements			
JB_MW09		N/A - see Table 7 for field measurements			
JB_MW07		N/A - see Table 7 for field measurements			
Albury Wodonga Military Area (Bandiana)					

Bore ID	Licence Status	Purpose / Use ¹	Depth	SWL	Lithology
BMA_4156814	-	Groundwater	20	-	-
BMA_MW02	N/A onsite bore - see Table 7 for field measurements				
BMA_MW03	N/A onsite bore - see Table 7 for field measurements				
BMA_MW04	N/A onsite bore - see Table 7 for field measurements				
BMA_MW06	N/A onsite bore - see Table 7 for field measurements				
HMAS Cerberus					
CER_40811469	-	Domestic	20.73	-	-
RAAF Base Tindal					
RN027754	-	-	27	12	-
RN037695	-	Production	26	10	-
RN027104	-	Production	19	9	-
RN035469	-	Production	32	7.5	-
RN037432	-	Other	45	5	-
RN037535	-	Production	33.8	15	-
RN031332	-	Production	39	16.2	-
RAAF Base Darwin					
NA - no bores sampled					
Robertson Barracks					
RN_034545	-	Monitoring	5	2.2	-
MTR Bore	N/A - see Table 7 for field measurements				
MTR Blue Standpipe	N/A - see Table 7 for field measurements				
RN038560	-	Investigation	5	-	-
RN003795	-	Production	33.4	6.6	-

Note 1: Obtained from State groundwater database information and not verified. The current bore use will be confirmed and discussed with bore owners upon provision of individual results.

4. Adopted screening levels

The adopted screening levels have been selected on the basis of the project objective stated in Section 1.2.

As such, the screening levels adopted for PFAS have been limited to those applicable to off-site users of groundwater contained in:

- *Defence Contamination Directive Number 8* (Directive 8) which are (a) 'Human Health (Drinking Water)' and (b) 'Recreational Use'.

This approach was considered appropriate given:

- The absence of other Nationally applicable guidance.
- The absence in Directive 8 of screening levels for PFAS for groundwater specifically applicable to the various types of agriculture (stock and irrigation) and aquaculture that may be occurring off-site.
- Uncertainty in relation to the applicability of other specific criteria due to the preliminary nature of the investigation and current uncertainty of the conceptual site model for each property.

On this basis, the adopted screening levels are considered to be protective of the following environmental values:

- Drinking water
- Recreation and aesthetics (e.g. use of groundwater for swimming pool make up water)

For the other (non-PFAS) parameters tested during the investigation the adopted screening levels were in accordance with the ASC NEPM and have been referenced from the following:

- *NHMRC, National Water Quality Management Strategy, Australian Drinking Water Guidelines 6, 2011* (ADWG 2011)
- *Guidelines for managing risk in recreational water (GMRRW)* (NHMRC 2008)
- *CSIRO, Sediment Quality Assessment: A Practical Guide, Recommended Sediment Guideline Values, CSIRO Publishing, 2016* (CSIRO 2016)

Table 5 shows the applicability of the guidelines to each relevant environmental value.

Table 5 Adopted guidelines for relevant environmental values and adopted PFAS screening levels for surface water and groundwater (µg/L)

ASC NEPM Environmental Value	Adopted Guideline	PFOS	PFOA	6:2 FtS	8:2 FtS	PFOS+PFHxS
Drinking water	Directive 8 - <i>Groundwater (Drinking Water)</i> for PFAS	0.2	0.4	5	-	-
	ADWG 2011 for all other parameters	N/A				
Recreational and aesthetics	Directive 8 – <i>Surface water (Recreational Use)</i> for PFAS	2	4	50	-	-
	NHMRC 2008 for all other parameters	N/A				

5. Results

The results of the investigation are contained within standalone reports that have been produced for each property. These have been included in **Appendix A**. The key investigation findings are provided below.

5.1 Aquifer characteristics, uses & restrictions

As part of the investigation a brief review was conducted of the aquifer characteristics, and any potential uses or restrictions in relation to the use of abstracted groundwater in the vicinity of each property. The results of the review are provided in Table 6.

5.2 Summary of PFAS results

A summary of field observations recorded during the investigation has been included in Table 7. A summary of analytical results and the (PFOS and PFOA) screening levels as specified in Section 4 is shown in Table 8.

The results are compared against the human health based screening levels specified in Directive 8 for (a) 'Human Health (Drinking Water)' and (b) 'Recreational Use'. The key findings for each site are discussed below.

5.2.1 RAAF Base Townsville

Ten on-site bores were sampled at RAAF Base Townsville between 27 and 29 April 2016. Three surface water and three sediment samples were also collected on 3 May 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	10	<0.01 to 61.4	<0.05 to 4.84	<0.5 to 0.09	<0.05	0.035 to 133.8	8 (80%)
Surface Water	3	0.13 to 58.9	<0.01 to 1.74	<0.05 to 0.05	<0.05	0.32 to 82.0	2 (67%)
Concentration range (mg/kg)							
Sediment	3	0.0005 to 0.145	<0.0005 to 0.0019	<0.005	<0.001	0.0004 to 0.0169	NA

Note 1: Directive 8 drinking water screening level

5.2.2 RAAF Base Amberley

Six existing bores (two onsite and four offsite) were sampled at RAAF Base Amberley between 30 May and 1 June 2016. Four surface water samples were also collected on 31 May and 1 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	6	<0.01 to 0.08	<0.01	<0.05	<0.05	<0.015 to 0.13	Nil
Surface Water	4	0.02 to 1.55	<0.01 to 0.12	<0.05 to 0.08	<0.05	<0.03 to 2.47	3 (75%)

Note 1: Directive 8 drinking water screening level

5.2.3 RAAF Base Richmond

Two groundwater samples and nine surface water samples were collected at RAAF Base Richmond between 6 June and 14 July 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	2	<0.01	<0.01	<0.05	<0.05	<0.015	Nil
Surface Water	9	<0.01 to 0.08	<0.01	<0.05	<0.05	<0.015 to 0.14	Nil

Note 1: Directive 8 drinking water screening level

5.2.4 Holsworthy Barracks

Five surface water samples were collected at Holsworthy Barracks on 15 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Surface Water	5	<0.01 to 0.2	<0.01	<0.05	<0.05	<0.015 to 0.38	Nil

Note 1: Directive 8 drinking water screening level

5.2.5 RAAF Base Wagga

Three existing offsite bores were sampled at Wagga on 15 June 2016. Two surface water samples were also collected on 15 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	3	<0.01 to 0.04	<0.01	<0.05	<0.05	<0.015 to 0.05	Nil
Surface Water	2	0.08 to 0.1	<0.01	<0.05	<0.05	0.13 to 0.18	Nil

Note 1: Directive 8 drinking water screening level

5.2.6 HMAS Creswell Jervis Bay Range Facility

Four groundwater samples and three surface water samples were collected at Jervis Bay on 5 July 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface		2	4	50	-	-	-

water (Recreational Use)' (µg/L)		Concentration range (µg/L)					
Groundwater	4	<0.01 to 0.02	<0.01	<0.05	<0.05	<0.015 to 0.05	Nil
Surface Water	3	0.44 to 8	<0.01 to 0.2	<0.05	<0.05	0.61 to 13.05	3 (100%)

Note 1: Directive 8 drinking water screening level

5.2.7 Albury Wodonga Military Area (Bandiana)

Four existing bores (three onsite and one offsite) were sampled at Bandiana on 6 and 7 June 2016. Three surface water samples were also collected on 6 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	4	<0.01	<0.01	<0.05	<0.05	<0.015	Nil
Surface Water	3	<0.01 to 0.5	<0.01	<0.05	<0.05	<0.015 to 0.75	1 (33%)

Note 1: Directive 8 drinking water screening level

5.2.8 HMAS Cerberus

One existing offsite bore was sampled at HMAS Cerberus on 10 June 2016. Three surface water samples were also collected on 10 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	1	<0.01	<0.01	<0.05	<0.05	<0.015	Nil
Surface Water	3	<0.05 to 1.58	<0.05	<0.05	<0.05	<0.05 to 1.92	1 (33%)

Note 1: Directive 8 or drinking water screening level

5.2.9 HMAS Stirling (Garden Island)

From the AECOM report provided, a total of eight groundwater monitoring wells were identified to contain PFAS analytical data available over multiple monitoring rounds between 2013 and 2016 (note that the number of bores sampled at each round varies). A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-
Concentration range (µg/L)						
Groundwater	8	<0.02 to 62.5	<0.02 to 22.6	<0.1 to 0.2	<0.1 to <0.5	2013: 4 of 6 (67%) 2015 May: 3 of 5 (60%) 2015 Sept: 4 of 6 (67%) 2016: 4 of 4 (100%)

Note 1: Directive 8 drinking water screening level

5.2.10 RAAF Base Tindal

Seven groundwater samples and two surface water samples were collected at RAAF Base Tindal on 22 and 23 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	7	<0.01 to 0.21	<0.01	<0.05	<0.05	<0.015 to 0.5	1 (14%)
Surface Water	2	0.11 to 0.38	<0.01	<0.05	<0.05	0.14 to 0.72	1 (50%)

Note 1: Directive 8 drinking water screening level

5.2.11 RAAF Base Darwin

Three surface water samples were collected at RAAF Base Darwin on 8 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹

Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)	0.2	0.4	5				-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)	2	4	50				-
Concentration range (µg/L)							
Surface Water	3	0.04 to 0.36	<0.01	<0.05	<0.05	0.07 to 0.6	2 (67%)

Note 1: Directive 8 drinking water screening level

5.2.12 Robertson Barracks

Four existing bores (one onsite and three offsite) were sampled at Robertson Barracks on 7 June 2016. One surface water sample was also collected on 7 June 2016. A summary of the analytical results for PFAS is provided below:

Media	No. Sample Locations	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+ PFHxS	No. locations exceeding screening level ¹
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L)		0.2	0.4	5	-	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L)		2	4	50	-	-	-
Concentration range (µg/L)							
Groundwater	4	<0.01	<0.01	<0.05	<0.05	<0.015	Nil
Surface Water	1	0.07	<0.01	<0.05	<0.05	0.08	Nil

Note 1: Directive 8 drinking water screening level

5.3 Data quality review

A detailed Quality Assurance and Control (QA/QC) assessment, including the collection and analysis of quality control samples, was completed as part of the investigation. This included the collection of inter and intra lab duplicates, field blank and rinsate blank samples.

The outcomes of the QA/QC assessment indicated that the data was valid and of sufficient quality to meet the data quality objectives for the investigation.

A copy of the detailed QA/QC report is provided in **Appendix B**.

Table 6 Aquifer characteristics, uses & restrictions

Property	State	Aquifer	GW Salinity (mg/L TDS)	Potential uses	GMU/ Management Plan	Authority	Restrictions on Use
RAAF Base Townsville	QLD	Quaternary sediments (clay, silt, sand, gravel, flood plain alluvium)	Variable; non saline (3,000) to saline (3,000+)	Irrigation, water supply, commercial	None, site is south of Bluewater (subartesian area) GMA	Department of Natural Resources and Mines	None identified
RAAF Base Amberley	QLD	Alluvium, potentially overlying basalt/ rhyolite OR Sandstone, siltstone, conglomerate	Non Saline (< 3,000). Alluvial aquifer is usually fresh	Potentially high quality groundwater (all uses)	Warrill - Bremer Alluvial Management Area (Morton Water Resource)	Department of Natural Resources and Mines	None identified
RAAF Base Richmond	NSW	Sandstone and siltstone, minor coal	1001 - 3000	Stock, domestic, town water supply	Greater Metropolitan Region Groundwater Sources 2011 Water Sharing Plan	NSW Office of Water	No bore installation within 250 m to over 500 m of contamination source identified in plan Restrictions in groundwater availability within 500 m of contamination source
Holsworthy Barracks	NSW	Sandstone and siltstone, minor coal	Unknown	Local/ major water utility, domestic and stock, town water supply	Greater Metropolitan Region Groundwater Sources 2011 Water Sharing Plan	NSW Office of Water	No bore installation within 250 m to over 500 m of contamination source. Restrictions in groundwater availability within 500 m of contamination source

Property	State	Aquifer	GW Salinity (mg/L TDS)	Potential uses	GMU/ Management Plan	Authority	Restrictions on Use
RAAF Base Wagga	NSW	Alluvial (sand, silt, gravel, clay). Noted as porous, high productivity. Upper aquifer: Cowra formation Middle aquifer: Lachlan Formation (fractured rock)	Non Saline (< 3,000)	Local and major water utility, domestic and stock, town water supply, salinity and water table management	Mid Murrumbidgee Alluvium NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011 Water Sharing Plan	NSW Office of Water	No bore installation within 250 m to over 500 m of contamination source identified in plan Restrictions in groundwater availability within 500 m of contamination source
HMAS Creswell Jervis Bay Range Facility	ACT	Uncertain. BOM indicates fractured, low - moderate productivity aquifer. Nearby bores have intersected both sand and sandstone	Unknown. No data on BOM.	Unknown.	Just outside South Coast Groundwater Sources Water Sharing Plan	-	-
Albury Wodonga Military Area (Bandiana)	VIC	Upper Tertiary/ Quaternary (clay, sand, silt) from approx. 10-30 m depth	<500	Maintenance of ecosystems; Potable water supply; Potable mineral water; Irrigation; Stock watering; Industrial Use; Primary contact recreation; Building and structures	Unincorporated	Goulburn Murray Water	All bore licences contain a disclaimer that water used under a water-use licence is not fit for any use that may involve human consumption, directly or indirectly, without first being properly treated.

Property	State	Aquifer	GW Salinity (mg/L TDS)	Potential uses	GMU/ Management Plan	Authority	Restrictions on Use
HMAS Cerberus	VIC	Bedrock > 10 m	1001 - 3500	Maintenance of ecosystems; Potable mineral water; Irrigation; Stock watering; Industrial Use; Primary contact recreation; Building and structures	Unincorporated	Southern Rural Water	None identified
RAAF Base Tindal	NT	Fractured and Karstic Rock (Tindall Limestone) Cavernous aquifer is largely unconfined in this zone	>2000	Public water supply, irrigation, Aquaculture, industry, stock and domestic (incl supply to Katherine and RAAF base)	Tindall Katherine Water Allocation Plan area Daly Roper Water Control District	Department of Land Resource Management	None located.
RAAF Base Darwin	NT	Sandstone	<2000	Maintenance of ecosystems; Potable mineral water; Irrigation; Stock watering; Industrial Use; Primary contact recreation; Building and structures	None found	Department of Land Resource Management	None identified
Robertson Barracks	NT	Fractured and weathered rocks: Shale/ greywacke/ sandstone	Non Saline (< 3,000)	Maintenance of ecosystems; Potable mineral water; Irrigation; Stock watering; Industrial Use; Primary contact recreation; Building and structures	Site sits just outside Darwin Rural Water Control District	Department of Land Resource Management	None identified

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	1/06/2016		surface water	grab	NA	NA	NA	NA	NA	14.5	8.07	1369.1	2106.2	8.24	80.3	Clear creek deep.
	1/06/2016		surface water	grab	NA	NA	NA	NA	NA	15.6	7.64	796.3	1225	5.59	104.3	Clear no od Samp appro
	1/06/2016		surface water	grab	NA	NA	NA	NA	NA	14.9	7.07	653.3	1005	6.6	107.4	Clear slight Samp appro deep.

V059155	6/06/2016		groundwater	domestic bore pump	-	-	-	-	5	19.9	6.79	964.0	1483	0.54	-69.8	Clear
V001	6/06/2016	RCH_QA01	groundwater	bailer	203.2	-	9.86	20	5	19.3	6.73	696.2	1071	1.75	-97.6	Clear
V001	6/06/2016		surface water	grab	NA	NA	NA	NA	NA	15.4	7.97	99.0	152.3	3.21	16.2	Clear Ricka
V002	6/06/2016	RCH_QA02	surface water	grab	NA	NA	NA	NA	NA	15	7.79	112.4	172.9	6.4	15.0	Brow Hawk
V003	6/06/2016		surface water	grab	NA	NA	NA	NA	NA	15.9	7.35	127.1	195.5	7.73	19.5	Clear Park
V005	14/07/2016		surface water	grab	NA	NA	NA	NA	NA	10.3	7.5	770.3	1185	6.16	85.0	Clear bore bore
V007	14/07/2016		surface water	grab	NA	NA	NA	NA	NA	9.3	7.75	116.2	178.8	7.82	75.1	Clear
V008	14/07/2016		surface water	grab	NA	NA	NA	NA	NA	9.1	7.71	104.7	161	7.24	75.7	Brow Coole
V009	14/07/2016		surface water	grab	NA	NA	NA	NA	NA	8.8	7.1	301.0	463.1	1.32	94.8	Clear
V004	30/06/2016		surface water	grab	NA	NA	NA	NA	NA	6.8	7.67	466.1	717	7.47	194.8	Brow cours
V006	30/06/2016	RCH_QA03	surface water	grab	NA	NA	NA	NA	NA	5.5	7.47	100.6	154.7	7.05	195.4	Clear samp near

J004	15/06/2016		surface water	grab	NA	NA	NA	NA	NA	11.6	6.67	150.7	231.9	6.03	87.2	Clear sedin
J002	15/06/2016	HBK_QA02	surface water	grab	NA	NA	NA	NA	NA	9.9	7.1	67.54	103.9	7.24	87.2	Clear
J001	15/06/2016	HBK_QA01	surface water	grab	NA	NA	NA	NA	NA	12.6	7.21	120.7	185.7	6.65	83.3	Clear (Geol
J005	15/06/2016		surface water	grab	NA	NA	NA	NA	NA	11.3	7.05	92.63	142.5	7.43	80.1	Clear near
J003	15/06/2016		surface water	grab	NA	NA	NA	NA	NA	11.5	6.73	183.8	282.7	7.06	90.6	Clear

N030714	15/06/2016	DUP001; DUP002	groundwater	bailer	200	0.15	15.228	23	5	18.8	8.38	166.8	256.6	0.32	-56.4	Turbi odour
N047279	15/06/2016		groundwater	bore pump	NA	NA	NA	NA	5	16.3	7.16	334.6	514.8	5.26	-30.0	Mostl
N047281	15/06/2016		groundwater	grab	50	0.61	14.1	49.34	5	17.5	6.74	193.6	297.8	0.61	85.8	Clear
N001	15/06/2016		surface water	grab	NA	NA	NA	NA	NA	7.7	8	113.6	174.8	3.91	115.0	Samp of ha

1	6/07/2016	CR_QA1; CR_Inter_QA1	groundwater	peristaltic pump	50	0	1.93	6.645	8	18.6	5.21	135.4 ¹	208.3	1.64	234.2	Clear
2	6/07/2016		groundwater	peristaltic pump	50	0	6.33	6.38	7	18.1	5.7	135.8 ¹	208.9	1.16	208.9	Clear
19	6/07/2016		groundwater	peristaltic pump	50	0.77	1.76	11.44	6	17	5.2	595.4 ¹	916	0.21	26.0	Red
17	6/07/2016		groundwater	peristaltic pump	50	0.72	1.1	6.91	7	15.9	5.32	955.5 ¹	1470	1.17	141.2	Red
	6/07/2016		surface water	grab	NA	NA	NA	NA	NA	15.2	7.56	348.4 ¹	536	1.3	117.3	Clear bound
	6/07/2016		surface water	grab	NA	NA	NA	NA	NA	14.3	6.99	374.5 ¹	576.2	0.83	161.2	Clear
	6/07/2016		surface water	grab	NA	NA	NA	NA	NA	13.9	7.62	420.6 ¹	647	1.17	-131.5	Clear
Area (Bandiana)																
56814	6/06/2016		groundwater	bailer	50	-	6.53	-	5	17.1	7.15	728		5.3	69.8	Rapid
V02	7/06/2016		groundwater	bailer	50	1.105	16.895	21.6	5	15.9	6.62	2249		3.3	84.2	Clear sediment allowed sample
V03	7/06/2016	DUP001; DUP002	groundwater	bailer	50	0.8	19.123	22.26	5	18.4	8.43	3536		1.88	144.6	Mode in we wait 19.36
V04	7/06/2016		groundwater	bailer	50	1.8	25.779	32.8	5.5	16.9	6.01	2145		2.83	103.0	Clear After for re
V06	7/06/2016		groundwater	bailer	50	0.83	8.444	8.72	-	-	-	-	-	-	-	Purge was e bailer bore,
V001	7/06/2016		surface water	grab	NA	NA	NA	NA	NA	10.4	7.41	34.45		8.35	83.6	No st from
V002	7/06/2016		surface water	grab	NA	NA	NA	NA	NA	11.6	6.66	85.8		6.83	105.6	No st from
V003	7/06/2016		surface water	grab	NA	NA	NA	NA	NA	12.8	6.72	42.9		7.92	97.5	No st from
811469	10/06/2016		groundwater	tap	NA	NA	NA	NA	5	13.2	8.15	734.5		3.87	151.3	Clear white tap, fi
V01	10/06/2016		surface water	grab	NA	NA	NA	NA	NA	12.1	7.2	9360 ¹	14401	6.27	44.2	Pale: sediment
V02	10/06/2016	CER_DUP001; CER_DUP002	surface water	grab	NA	NA	NA	NA	NA	12.3	7.34	13980 ¹	21508	6.65	66.8	Clear and n
V03	10/06/2016		surface water	grab	NA	NA	NA	NA	NA	11.2	7.65	176.5		10.84	79.6	Clear sediment
54	22/06/2016	TIN_RB001	groundwater	tap	NA	NA	NA	NA	NA	29.6	7.16	455 ¹	700	3.74	139.5	Clear
35	22/06/2016		groundwater	pump	NA	0.33	12.61	NA	5	29.7	6.89	438.1 ¹	674	3.65	156.8	Clear
34	22/06/2016		groundwater	tap	NA	NA	NA	NA	NA	30.7	6.63	411.5 ¹	633	3.44	166.4	Clear

		IN_D0P004		Sampler													
002	22/06/2016		surface water	long arm sampler	NA	NA	NA	NA	NA	18.7	8.14	187.3 ¹	288.1	264 6.73	169.8		road Very stagn poole
V01	8/06/2016	RDRW QA1; DRW QC1 ²	surface water	grab	NA	NA	NA	NA	NA	27.7	6.95	39.7	62	4.06	115.0		Clear organ under Samp McMi
V02	8/06/2016		surface water	grab	NA	NA	NA	NA	NA	27.1	5.71	35.7	55	2.91	83.0		Clear prese Creef
V03	8/06/2016		surface water	grab	NA	NA	NA	NA	NA	28.8	6.32	33730.0	51900	1.94	55.0		Turbi Samp high :
545	7/06/2016		groundwater	bail	50	0	4.1505	5	8	31.8	6.42	25.3	39	3.14	113.1		Clear
e	7/06/2016		groundwater	tap	NA	NA	NA	NA	20	33.6	6.06	52.7	80	3.5	127.7		Slight range collec
e Standpipe	7/06/2016		groundwater	bail	-	-	3.02	12	-	-	-	-	-	-	-		No se root in slugs
30	7/06/2016		groundwater	bail	50	0	4.02	5.65	10	32.5	4.27	22.8	35	20.9	160.0		Clear
35	7/06/2016	ROB QA01; ROBQC01 ²	groundwater	tap	NA	NA	NA	NA	10	34	6.54	39.0	69.8	3.46	-16.6		Oran
01	7/06/2016		surface water	grab	NA	NA	NA	NA	NA	30.7	6.64	20.8	35.4	3.54	124.1		Slight stagn prese collec creek

Not applicable

from EC (uS/cm) to TDS (mg/L) by multiplying by 0.65, as per generic conversion factor provided in manuals for YSIPro models.

plit at laboratory

lues provided are approximate only

Table 8 Summary of analytical results for PFOS, PFOA and 6:2 FTS, 8:2 FTS and PFOS+PFHxS (µg/L)

Property (off-site / on-site)	Sample Type	Location ID	Sample Date	PFOS	PFOA	6:2 Fts	8:2 Fts	PFOS+PFHxS ⁽¹⁾
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L) (exceedances <u>underlined</u>)				<u>0.2</u>	<u>0.4</u>	<u>5</u>	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L) (exceedances bold)				2	4	50	-	-
RAAF Base Townsville								
Onsite	groundwater	RAAFTVL 49	27/04/2016	<u>1.98</u>	0.11	<0.05	<0.05	5.34
Onsite	groundwater	RAAFTVL 04	27/04/2016	<0.01	0.01	<0.05	<0.05	0.35
Onsite	groundwater	RAAFTVL26	27/04/2016	43	<u>1</u>	0.08	<0.05	54.7
Onsite	groundwater	RAAFTVL33	27/04/2016	55.7	<u>2.39</u>	0.09	<0.05	70.7
Onsite	groundwater	RAAFTVL02	27/04/2016	2.79	0.1	<0.05	<0.05	5.22
Onsite	groundwater	RAAFTVL102	27/04/2016	<0.05	<0.05	<0.05	<0.05	2.165
Onsite	groundwater	RAAFTVL57	27/04/2016	0.39	0.05	<0.05	<0.05	1.89
Onsite	groundwater	RAAFTVL43	27/04/2016	61.4	4.84	<0.05	<0.05	133.8
Onsite	groundwater	RAAFTVL09	27/04/2016	17.9	<u>0.6</u>	<0.05	<0.05	27.52
Onsite	groundwater	RAAFTVL114	27/04/2016	25.9	<u>0.76</u>	<0.05	<0.05	44.5
Onsite	surface water	SS01	27/04/2016	3.18	0.11	<0.05	<0.05	5.54
Onsite	surface water	SS02	27/04/2016	0.13	<0.01	<0.05	<0.05	0.32
Onsite	surface water	SS03	27/04/2016	58.9	<u>1.74</u>	0.05	<0.05	82.0
RAAF Base Amberley								
Onsite	groundwater	154503	1/06/2016	0.08	<0.01	<0.05	<0.05	0.13
Offsite (Private land)	groundwater	154522	1/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	154495	1/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	groundwater	14310188	1/06/2016	<0.05	<0.05	<0.05	<0.05	0.05
Onsite	groundwater	154505	1/06/2016	0.03	<0.01	<0.05	<0.05	0.04
Offsite	groundwater	14310091	1/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	surface water	SW001	1/06/2016	<u>1.05</u>	0.12	<0.05	<0.05	1.7
Onsite	surface water	SW002	1/06/2016	<u>1.55</u>	0.11	0.08	<0.05	2.47
Offsite	surface water	SW003	1/06/2016	<u>0.33</u>	0.04	<0.05	<0.05	0.67
Offsite	surface water	SW004	1/06/2016	0.02	<0.01	<0.05	<0.05	0.03

Property (off-site / on-site)	Sample Type	Location ID	Sample Date	PFOS	PFOA	6:2 FtS	8:2 FtS	PFOS+PFHxS ⁽¹⁾
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L) (exceedances <u>underlined</u>)				<u>0.2</u>	<u>0.4</u>	<u>5</u>	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L) (exceedances bold)				2	4	50	-	-
RAAF Base Richmond								
Offsite	groundwater	RCH_GW001	06/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	RCH_GW059155	06/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	surface water	RCH_SW001	06/06/2016	0.04	<0.01	<0.05	<0.05	0.05
Offsite	surface water	RCH_SW002	06/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	surface water	RCH_SW003	06/06/2016	0.04	<0.01	<0.05	<0.05	0.05
Offsite	surface water	RCH_SW004	30/06/2016	0.04	<0.01	<0.05	<0.05	0.07
Offsite	surface water	RCH_SW005	14/07/2016	0.03	<0.01	<0.05	<0.05	0.08
Offsite	surface water	RCH_SW006	30/06/2016	0.02	<0.01	<0.05	<0.05	0.03
Offsite	surface water	RCH_SW007	14/07/2016	0.06	<0.01	<0.05	<0.05	0.09
Offsite	surface water	RCH_SW008	14/07/2016	0.08	<0.01	<0.05	<0.05	0.14
Offsite	surface water	RCH_SW009	14/07/2016	0.02	<0.01	<0.05	<0.05	0.04
Holsworthy Barracks								
Offsite	surface water	HBK_SW004	15/06/2016	0.2	<0.01	<0.05	<0.05	0.38
Offsite	surface water	HBK_SW002	15/06/2016	0.08	<0.01	<0.05	<0.05	0.16
Offsite	surface water	HBK_SW001	15/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Onsite	surface water	HBK_SW005	15/06/2016	0.09	<0.01	<0.05	<0.05	0.14
Offsite	surface water	HBK_SW003	15/06/2016	0.04	<0.01	<0.05	<0.05	0.09
RAAF Base Wagga								
Offsite	groundwater	WAG_GW030714	15/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	groundwater	Bore 5, GW047279	15/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	groundwater	WAG_GW047281	15/06/2016	0.04	<0.01	<0.05	<0.05	0.05
Offsite	surface water	WAG_SW001	15/06/2016	0.1	<0.01	<0.05	<0.05	0.18
Offsite	surface water	WAG_SW002	15/06/2016	0.08	<0.01	<0.05	<0.05	0.13

Property (off-site / on-site)	Sample Type	Location ID	Sample Date	PFOS	PFOA	6:2 FtS	8:2 FtS	PFOS+PFHxS ⁽¹⁾
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L) (exceedances <u>underlined</u>)				<u>0.2</u>	<u>0.4</u>	<u>5</u>	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L) (exceedances bold)				2	4	50	-	-
HMAS Creswell Jarvis Bay Range Facility								
Offsite – HMAS Creswell	groundwater	CR_MW1	05/07/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite – HMAS Creswell	groundwater	CR_MW2	05/07/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Onsite	groundwater	JB_MW07	05/07/2016	0.02	<0.01	<0.05	<0.05	0.05
Onsite	groundwater	JB_MW09	05/07/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Onsite	surface water	JB_SS1	05/07/2016	<u>0.44</u>	<0.01	<0.05	<0.05	0.61
Onsite	surface water	JB_SS2	05/07/2016	8.00	0.2	<0.05	<0.05	13.05
Onsite	surface water	JB_SS3	05/07/2016	<u>0.63</u>	<0.01	<0.05	<0.05	1.42
Albury Wodonga Military Area (Bandiana)								
Offsite	groundwater	BMA_4156814	6/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Onsite	groundwater	BMA_MW02	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Onsite	groundwater	BMA_MW03	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Onsite	groundwater	BMA_MW04	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	surface water	BMA_SW001	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	surface water	BMA_SW002	7/06/2016	0.09	<0.01	<0.05	<0.05	0.11
Offsite	surface water	BMA_SW003	7/06/2016	<u>0.5</u>	<0.01	<0.05	<0.05	0.75
HMAS Cerberus								
Offsite (Private land)	groundwater	CER_40811469	10/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	surface water	CER_SW01	10/06/2016	<0.05	<0.05	<0.05	<0.05	<0.05
Offsite	surface water	CER_SW02	10/06/2016	<0.05	<0.05	<0.05	<0.05	<0.05
Offsite	surface water	CER_SW03	10/06/2016	<u>1.58</u>	<0.05	<0.05	<0.05	1.92
RAAF Base Tindal								
Offsite (Private land)	groundwater	TIN_RN027104	22/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	TIN_RN027754	22/06/2016	<u>0.21</u>	<0.01	<0.05	<0.05	0.5
Offsite (Private land)	groundwater	TIN_RN031332	22/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	TIN_RN035469	23/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015

Property (off-site / on-site)	Sample Type	Location ID	Sample Date	PFOS	PFOA	6:2 FtS	8:2 Fts	PFOS+PFHxS ⁽¹⁾
Screening Level - Directive 8 'Groundwater (Drinking Water)' (µg/L) (exceedances <u>underlined</u>)				<u>0.2</u>	<u>0.4</u>	<u>5</u>	-	-
Screening Level - Directive 8 'Surface water (Recreational Use)' (µg/L) (exceedances bold)				2	4	50	-	-
Offsite (Private land)	groundwater	TIN_RN037432	22/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	TIN_RN037535	22/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	TIN_RN037695	22/06/2016	0.05	<0.01	<0.05	<0.05	0.09
Offsite	surface water	TIN_SW001	23/06/2016	0.11	<0.01	<0.05	<0.05	0.14
Offsite	surface water	TIN_SW002	23/06/2016	<u>0.38</u>	<0.01	<0.05	<0.05	0.72
RAAF Base Darwin								
Offsite	surface water	DRW SW01	8/06/2016	<u>0.36</u>	<0.01	<0.05	<0.05	0.6
Offsite	surface water	DRW SW02	8/06/2016	<u>0.3</u>	<0.01	<0.05	<0.05	0.48
Offsite	surface water	DRW SW03	8/06/2016	0.04	<0.01	<0.05	<0.05	0.07
Robertson Barracks								
Offsite (Private land)	groundwater	RN_034545	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Onsite (within boundary of the Training Range)	groundwater	MTR Bore	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	RN038560	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite (Private land)	groundwater	RN003795	7/06/2016	<0.01	<0.01	<0.05	<0.05	<0.015
Offsite	surface water	ROB SW01	7/06/2016	0.07	<0.01	<0.05	<0.05	0.08

Note (1) Where one result was below the laboratory limit of reporting, the value used to calculate the total was the detection limit multiplied by 0.5. For example, where PFHxS was reported below the detection limit (<0.00002 µg/L) a reported result of 0.00001 µg/L was assumed.

Appendices

Appendix A – Site Reports

Appendix B – QAQC Review

GHD

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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Preliminary						20/07/16
Draft						08/08/16
Final	█ ████	█ ████	<i>Signature on original</i>	█ ████	<i>Signature on original</i>	25/08/16
Final	█ ████	█ ████	<i>Signature on original</i>	█ ████	<i>Signature on original</i>	07/09/16
Final	█ ████	█ ████	<i>Signature on original</i>	█ ████	<i>Signature on original</i>	15/09/16

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Stedman, Andrew (Health)

From: McNeill, Laura (Health) on behalf of Kelly, Paul (Health)
Sent: Thursday, 27 October 2016 3:42 PM
To: McNeill, Laura (Health)
Subject: FW: HMAS Albatross test results [SEC=UNCLASSIFIED]
Attachments: HMAS Albatross: Preliminary Site Investigation Report & Community Presentations [SEC=UNCLASSIFIED]

From: [REDACTED]@infrastructure.gov.au
Sent: Thursday, 27 October 2016 10:30 AM
To: Kelly, Paul (Health)
Cc: Dale, Emm (Health); Rutledge, Geoffrey; [REDACTED]
Subject: HMAS Albatross test results [SEC=UNCLASSIFIED]

Good Morning Dr Kelly

I am following up actions from the last PFAS working group meeting. Defence were to provide you with the results from HMAS Albatross. You may already have received these, but I am sending them to you, just in in case.

Defence have provided hyperlinks in the attached email which will take you the information you requested.

Regards

[REDACTED]

[REDACTED]

Jervis Bay Territory Administration
 Local Government, Mainland Territories & RDA Branch
 Local Government and Territories Division
 Department of Infrastructure & Regional Development
02 6274 7874
 ? Northbourne Avenue | GPO Box 594 | Canberra ACT 2601
 [REDACTED]@infrastructure.gov.au

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Stedman, Andrew (Health)

From: [REDACTED]@defence.gov.au>
Sent: Monday, 10 October 2016 6:06 PM
To: [REDACTED]@infrastructure.gov.au"; [REDACTED]
Cc: [REDACTED]
Subject: HMAS Albatross: Preliminary Site Investigation Report & Community Presentations [SEC=UNCLASSIFIED]

UNCLASSIFIED

Hi [REDACTED],

As discussed.

Preliminary Site Investigation ReportExecutive Summary: <http://www.defence.gov.au/id/ Master/docs/Albatross/Stage1-PSIt-ExecutiveSummary.pdf>Full Report: <http://www.defence.gov.au/id/ Master/docs/Albatross/Stage1-PSI-WithAppendices.pdf>**HMAS Albatross - Community Consultation**

Initial Community Consultation Session (18 May 16):

<http://www.defence.gov.au/id/ Master/docs/Albatross/CommunityInfoBrief.pdf>

Preliminary Site Investigation Presentation (5 Oct 16):

<http://www.defence.gov.au/id/ Master/docs/Albatross/CommunityInfoSession05Oct16Presentation.pdf>

Regards

Patrick

[REDACTED]
Contractor to Defence
PFAS Investigation and Management Branch
Department of Defence
[REDACTED]

BP26-2-B012
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PO Box 7925 Canberra BC 2610

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White, Sarah-Jane (Health)

From: [REDACTED]@infrastructure.gov.au>
Sent: Tuesday, 22 November 2016 2:55 PM
To: Krsteski, Radomir (Health)
Cc: [REDACTED]
Subject: RE: Jervis Bay Territory Health protection water testing [SEC=UNCLASSIFIED]

Radomir

Thank you for the advice. I look forward to receiving the results and analysis.

Kind regards

[REDACTED]
 [REDACTED] Jervis Bay Territory Administration
 Local Government, Mainland Territories & Regional Development Australia Branch | Local Government and Territories Division
 Department of Infrastructure and Regional Development
 GPO Box 594, Canberra ACT 2601
 t 02 6274 7795
 e [REDACTED]@infrastructure.gov.au | w www.infrastructure.gov.au

From: Krsteski, Radomir (Health) [mailto:Radomir.Krsteski@act.gov.au]
Sent: Tuesday, 22 November 2016 2:53 PM
To: [REDACTED]
Cc: [REDACTED]; Stedman, Andrew (Health); Barr, Conrad (Health)
Subject: RE: Jervis Bay Territory Health protection water testing [SEC=UNCLASSIFIED]

Hi [REDACTED]

Sorry for the delay in responding, I can confirm that ACT Health will be retesting all of the sites previously tested for PFOS and PFOA. One of my officer will be collecting samples on the 28 and 29 November. We anticipate that we will have results of analysis within two weeks of sampling and will pass on this information once cleared by my Executive Director. Please let me know if you need any more information.

Kind regards,
 Rad

**Radomir Krsteski**

A/g Manager | Environmental Health
 Health Protection Service | Population Health | ACT Health
 25 Mulley Street Holder ACT | Locked Bag 5005 Weston Creek ACT 2611

T 02 62050956 | M Mobile [REDACTED] | E radomir.krsteski@act.gov.au | Website |

From: [REDACTED]@infrastructure.gov.au
Sent: Friday, 11 November 2016 10:04 AM
To: Krsteski, Radomir (Health)
Cc: [REDACTED]
Subject: Jervis Bay Territory Health protection water testing [SEC=UNCLASSIFIED]
Importance: High

Good morning Radomir

I understand that ACT Health are scheduled to test JBT potable and recreation waters this month and that testing for this round will include PFAS.

I would be grateful for your confirmation of the testing dates and when the results can be provided to the Department – including an interpretation of the test results.

Your advice appreciated.

[REDACTED]
[REDACTED]
Jervis Bay Territory Administration
Local Government, Mainland Territories & Regional Development Australia Branch
Local Government and Territories Division
Department of Infrastructure & Regional Development
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White, Sarah-Jane (Health)

From: McNeill, Laura (Health)
Sent: Tuesday, 22 November 2016 5:10 PM
To: Krsteski, Radomir (Health)
Subject: FW: Item 3 6 - PFAS 21112016.docx [SEC=UNCLASSIFIED]
Attachments: Item 3 6 - PFAS 21112016.docx

From: Pengilley, Andrew (Health)
Sent: Monday, 21 November 2016 2:53 PM
To: McNeill, Laura (Health)
Cc: Kelly, Paul (Health)
Subject: FW: Item 3 6 - PFAS 21112016.docx [SEC=UNCLASSIFIED]

Hi Laura,

Please find attached PFAS AHMAC brief.

A

From: Harper, Emily (Health)
Sent: Monday, 21 November 2016 2:49 PM
To: Pengilley, Andrew (Health)
Subject: Item 3 6 - PFAS 21112016.docx [SEC=UNCLASSIFIED]

A couple of very minor amendments (largely inadvertent keyboard mashage). Otherwise, I think fine.

Cheers,

Emily



MINUTE

**SUBJECT: AHMAC - Request for Briefing
Item 3.6 – Per- and poly- fluorinated alkyl
substances update**

To: Dr Paul Kelly – Chief Health Officer, Population Health Protection and Prevention

From: Judith Colquhoun – AHMAC / COAG Health Council Coordinator

Date: 18/11/16

TRIM: AHM16/102

The next meeting of AHMAC is on **Friday 2 December 2016**.

I would appreciate if you would prepare a background briefing paper for the Director-General on the above mentioned topic.

Each brief should be about one-two pages, with detailed background on the issues to ensure that the Director-General is thoroughly briefed. Please use dot points and also consider the relevance to the ACT of each paper.

Could you please forward your brief to me by **Noon Wednesday 23 November 2016** to allow the Director-General sufficient time to clear the briefings prior to the meeting.

Should you require any additional information, please contact Judith Colquhoun on 50848.

Judith Colquhoun
AHMAC / COAG Health Council Coordinator

**Australian Health Ministers' Advisory Council
(AHMAC) BRIEFING**

Date of Meeting: 2 December 2016

**Agenda Item 3.6
Originator: C'wealth for AHPPC**

PER- AND POLY-FLOURINATED ALKYL SUBSTANCES UPDATE

RECOMMENDATIONS

That AHMAC members note the Per- and poly-fluorinated alkyl substances (PFAS) update.

ACT RESPONSE

Please answer each recommendation individually.

1. Noted

There is currently minimal direct impact on the ACT from this issue.

The ACT Government has been involved in providing assistance to the Department of Infrastructure and Regional Development (DIRD) in managing PFAS contamination in the Jervis Bay Territory (JBT) under an existing intergovernmental arrangement.

HMAS Creswell, a Navy base at Jervis Bay, is contaminated with PFAS from fire-fighting foam deployed in training exercises on the base. HMAS Creswell is administered by the Department of Defence (DOD)

Some of these chemicals have leached into the adjacent Mary Creek which runs through the Wreck Bay aboriginal community.

ACT Health and the ACT Environmental Protection Agency (Access Canberra) have tested water sources at JBT. PFAS was not detected in drinking water, but levels in Mary Creek exceed those considered safe in the national enHealth guidelines.

The ACT Chief Health Officer has advised DIRD to restrict use of Mary Creek until a full exposure assessment of the Wreck Bay community can be performed. The CHO has met with representatives of the Wreck Bay community, DIRD and the DOD on two occasions to explain the potential health risks associated with PFAS.

PFAS are a group of related chemicals which have been used as surfactants in a range of industrial settings including non-stick cookware, cleaning agents and fire-fighting foam. Although use of these chemicals is now restricted, they are highly durable in the environment. All residents of Australia have measurable levels of PFAS in their tissues from exposure to industrial chemicals, food or water containing PFAS.

PFAS exposure has been associated with a wide range of medical conditions based largely on animal or molecular studies. There is little direct evidence of specific health effects in humans from exposure to PFAS. Further epidemiological study may prove or exclude a link between PFAS exposure and human illness.

KEY SPEAKING POINTS FOR THIS ITEM

- The ACT notes the information contained in the paper
- The ACT supports further study into the human health effects of PFAS.
- The ACT notes that while resources have been made available to mitigate PFAS exposure in Williamstown and Oakey, mitigation of exposure may be required at other sites e.g. JBT.

Action Officer: Andrew Pengilley

Phone: 6207 0291

Manager: Paul Kelly

Area: PHPPD

Phone: 6205 0883

White, Sarah-Jane (Health)

From: Krsteski, Radomir (Health)
Sent: Friday, 9 December 2016 2:19 PM
To: [REDACTED]@doh.nsw.gov.au
Subject: FW: RESULTS & EDD for ALS Workorder : CA1606699 | Your Reference: Jervis Bay [SEC=UNCLASSIFIED]
Attachments: PFOS PFOA sample map.pdf

Hi [REDACTED],

To summarise what we discussed and provide you with information about Kullindi homestead, the water is bore sourced, to supply the heritage listed homestead providing accommodation for holiday goers. PFAS was detected in Kullindi homestead drinking water at 0.04µg/L (sampled 29/11/2016). The bore water has a small treatment setup with the following setup: first filter of 10microns; second Filter 0.5 microns; UV radiation; and then to taps. The water services a total five separate units within the main building, set around a common courtyard that includes two all weather gas fired BBQs, for a maximum of 20 guests at one time not including the owner/manager. The sample was from a tap at one of the BBQs. I have attached a copy of the map showing all of the PFAS sampling sites.

The results is well below enHealth interim PFAS health reference values of 0.5ug. It seems that in the least people exposed are not residents except for the owner/manager and their potential family. Total dietary exposure of transient populations should be minimal and low risk.

The nature of the site being bore water may influence the potential for fluctuations that may coincide with weather patterns as PFAS may intermittently migrates to the bore reservoir or as you suggested an initial plume. This may explain why previous (May 2016) results found nothing. As discussed we will organise sampling of all bore water sites and increase our sampling rate to determine whether it is an emerging or receding plume. As discussed do we hold back on public messaging considering there are no public health concerns and reassess this when we get further information?

Just some additional information to this, while we found no PFAS from Lake Windemere surface water we did find it in the Lake's raw water extraction point (at 2.99ug/L) which varies and is generally a lot lower than the surface. Lake Windemere it is rain fed, but in saying that it would still get some ground water through aquifers at its lower depths and stratification would reduce mixing. The Lake's water treatment process of: pre Ozone generator and flocculation; sand filtration; ozone treatment & ozone contact tank; carbon filtration (removes ozone); chlorination at 1.5mg/L and; fluoridation, did successfully remove the PFAS from the water as evidenced by end point testing of the treated water sample taken from the plant. Lake Windemere it is rain fed, but in saying that it would still get some ground water through aquifers at its lower depths.

The previous results (May 2016) found no PFAS in the Lake's raw water extraction sample, which could potentially reinforce the assumption that weather and namely large rainfall can influence PFAS levels in this area.

Cheers
Rad