

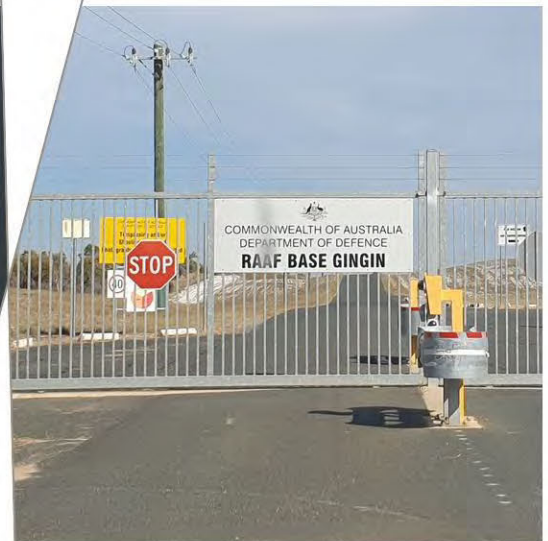
PFAS OMP - 2021 Annual Interpretive Report

Gingin Satellite Airfield

304700525

Prepared for
Department of Defence

29 May 2023



 **Cardno**

now

 **Stantec**

Contact Information

Stantec Australia Pty Ltd

Cardno, now Stantec
ABN 77 009 119 000

11 Harvest Terrace
West Perth WA 6005
Australia

www.cardno.com
Phone +61 8 9273 3888
Fax +61 8 9486 8664

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Senior Environmental Engineer


Principal Environmental Scientist/Regional WA Project Manager

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Executive Summary

Introduction

Cardno, now Stantec, were engaged by the Australian Department of Defence (Defence) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP)¹ at the Royal Australian Air Force (RAAF) Gingin Satellite Airfield, Western Australia (WA).

The OMP outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater and tap water originating from the RAAF Gingin Satellite Airfield, WA (the site). The monitoring program consisted of biannual monitoring events undertaken post-winter (October 2020), and post-summer (April 2021) with additional quarterly events in January 2021 and July 2021 that sampled from a subset of the biannual monitoring locations.

The Monitoring Area comprises both on-site and off-site areas. The on-site area is also identified as the Management Area (Department of Defence 2018b)², as shown in **Figure 1 in Appendix A** of this report). The off-site area incorporates the Yeal Swamp Nature Reserve to the south, north and west. Risks from PFAS contamination within this area are considered low and are not actively managed. The Monitoring Area is shown on **Figure 2-1 of Section 2** of this report.

Objectives

The objective of the ongoing monitoring program is to assess changes in the nature and extent of PFAS within the environment. The OMP used the monitoring network developed as part of the PFAS Management Area Plan (PMAP) to monitor the amount of PFAS leaving the Base through the groundwater. The PMAP was designed to target areas where there is a potentially elevated risk to a receptor (for example, to people or the environment) associated with Defence's historical use of legacy aqueous film forming foam (AFFF).

Monitoring Scope

The September 2020 - August 2021 monitoring period comprised four monitoring events conducted in general accordance with the Sampling and Analysis Quality Plan (SAQP). Deviations from the SAQP are summarised within Section 3.4 of this report. Scope of works involved biannual monitoring of groundwater within the Monitoring Area in October 2020 (post winter) and April 2021 (post summer).

In addition, sampling of water from selected taps (on-base), abstraction bores (on and off-base) and selected off-base groundwater monitoring wells was also conducted on a quarterly basis.

Groundwater Results

Groundwater Flow Direction

The local groundwater beneath the Base flows to the west-south-west, with a component of the groundwater at the southern portion of the base flowing south. This is a slight deviation to the regional groundwater which flows west, towards the Yeal Swamp Nature Reserve. Local groundwater elevations and flow direction were consistent with results from previous monitoring rounds. Information from previous monitoring rounds can be found in the 2020 Annual Interpretive Report (AIR) and Detailed Site Investigation (DSI).²

PFAS Concentrations

PFAS concentrations in groundwater generally remained within an order of magnitude of the data collected at the locations during previous monitoring rounds.

What is an 'order of magnitude'?

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

¹ The OMP is publically available at www.defence.gov.au/Environment/PFAS/gingin, and is found as Attachment 1 of the PMAP

² Publically available at www.defence.gov.au/Environment/PFAS/gingin

What is a 'limit of reporting'?

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

Sum of Perfluorooctane Sulfonate (PFOS) and Perfluorohexane Sulphonate (PFHxS) concentrations in groundwater during the monitoring period ranged from below the laboratory limit of reporting (LOR) (0.01 µg/L) to 23.6 µg/L (powerhouse source area). Where new exceedances were identified they were within or downgradient of known source areas (Fire house and refuelling area and Landfills).

As identified during the DSI investigation, PFAS contaminant plumes are present in some locations. PFAS contaminant plumes are identified as localised areas of PFAS contamination that slowly moves with the groundwater away from the source areas.

To determine the stability and extent of potential PFAS plume migration in groundwater, statistical analysis (Mann-Kendal) was undertaken within the Monitoring Area. This showed that the PFAS plume is generally stable. Some wells within the former fuel farm, fire house and refuelling area, and at the landfill showed an increasing trend, and some wells within the former fuel farm, the powerhouse source area, and drainage channel showed a decreasing trend. Overall, the groundwater monitoring results do not suggest a change in the understanding of contamination or risk at the source areas.

Tap water results

All tap water results for the monitoring period were above the adopted HEPA (2020) PFAS NEMP Human Health Drinking Water guidelines, but below the recreational guidelines. PFAS concentrations in tap water generally remained within one order of magnitude of the historical data collected at the sampling locations.

Based on the tap water results, PFAS concentrations within tap water at sampling locations were either stable or showed increasing trends. PFAS concentrations appeared to be increasing at the air traffic control tower and the fire house kitchenette. These locations are not used for potable water (with "not for drinking water use" signage) and it is noted that a number of these buildings are in the process of being demolished. As a result, there is no change in the understanding of the contamination or risk at these sampling locations.

Risk Summary

A review of the sources, pathways and receptors presented in the PMAP has been undertaken within this report. No new sources of PFAS contamination, transport pathways or potential receptors were identified during this monitoring period. Abstracted groundwater is currently not used for drinking purposes on-site and this management measure should remain in place to prevent potential risk to human health.

PFAS concentrations were consistently reported above the HEPA (2020) drinking water criterion at a boundary monitoring well downgradient of the on-site source areas, and an off-site monitoring well. This indicates a possible off-site migration pathway to the south-west. However, no detects have been reported to date at a well further downgradient, and the potential risk to offsite receptors therefore remains unchanged.

Based on the data collected from the previous monitoring rounds and the current monitoring round, there is no significant change to the overall risk profile of the Management Area or the Monitoring Area. The risk profile remains low and acceptable.

Conclusions

The 2020 - 2021 monitoring results met the objective of the OMP and work was carried out in general accordance with the SAQP.

Overall, the concentrations of PFAS in groundwater and tap water at on-site locations across the Management Area have remained consistent with historical data. The results of the Mann-Kendall trend analysis indicate that the PFAS plume generally displays a stable or no statistically significant trend, with the exception of some monitoring wells that are trending higher ('increasing' or 'probably increasing') and others that are trending lower ('decreasing' or 'probably decreasing'). These will be reviewed over the next monitoring rounds to determine if any identified trends continue.

PFAS concentrations across the tap water network on-site generally displayed a stable or no statistically significant trend with the exception of a 'probably increasing' trend reported at the air traffic control tower and at the fire house kitchenette. On-site abstraction bores, understood to be connected to the site's water tanks and tap network, will continue to be monitored for PFAS as part of the PFAS OMP.

The nature and extent of PFAS in groundwater and tap water off-site has not changed from the understanding presented in the 2020 AIR and the PMAP. Based on the current available data there is no significant change to the risk profile of the Monitoring Area.

Given the remaining PFAS concentrations within the Monitoring Area, it is recommended that the ongoing monitoring program of groundwater and tap water is continued to monitor the extent of PFAS, potential migration, and any associated risk changes.

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Technical Terms & Abbreviations

AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
AIR	Annual Interpretive Report
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
BGL	Below Ground Level
COC	Chain of Custody
CSM	Conceptual Site Model
DSI	Detailed Site Investigation
EC	Electrical Conductivity
EPA	Environment Protection Authority
ERA	Ecological Risk Assessment
ESA	Environmental Site Assessment
HEPA	Heads of Environmental Protection Authority
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
PSI	Preliminary Site Investigation
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
RWL	Reduced water level
SAQP	Sampling and Analysis Quality Plan
SWL	Standing Water Level

Units

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

Chemical Names

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

Site Specific

OMP	Ongoing Monitoring Plan
PMAP	PFAS Management Area Plan
RAAF	Royal Australian Air Force

1 Introduction

The Australian Department of Defence ('the Client' or 'Defence') engaged Cardno Pty Ltd (Cardno) to undertake the implementation of the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) at Royal Australian Air Force (RAAF) Gingin Satellite Airfield ('the site'). The site is located in Yeal, Western Australia (WA) and is displayed in Figure 1, Appendix A.

1.1 Background

The site is located on Commonwealth Land and is regulated under Commonwealth environmental legislation. The PFAS OMP outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater originating from the site.

The OMP includes sampling and analysis, not only from the site (Management Area), but also from a number of surrounding (off-site) groundwater monitoring wells (Monitoring Area). The Management Area is defined in the PFAS management area plan (PMAP, Defence, 2018b) as the area for which active management of risks relating to PFAS contamination are required. The Monitoring Area is defined as the area where risks relating to PFAS contamination are currently considered to be acceptably low and therefore active management of these risks is not considered necessary.

For the purposes of this report:

- > The Management Area was defined as Gingin Satellite Airfield (Figure 2, Appendix A).
- > The Monitoring Area was defined as comprising the site, plus the parcel of Crown Land that represents the Yeal Swamp Nature Reserve – an area that surrounds much of the southern, western and northern extent of the site. The lateral extents of the Monitoring Area are aligned with the boundary of the adjoining Crown Lands property (Figure 1, Appendix A).

1.2 Purpose & Objectives

The objective of the OMP is to *"set out a program of monitoring of groundwater (on and off-site), tap water (non-potable) and existing Abstraction Bore 2 water quality to continue to assess the changes in the nature and extent of PFAS within the environment, where there is an identified potentially elevated risk to a receptor or a potential future risk to a receptor associated with Defence's historical use of legacy AFFF"*.

The scope of the monitoring specified in the OMP is to:

- > Evaluate the nature and extent of PFAS in groundwater beyond the southern boundary of the site;
- > Assess variability inherent in laboratory methods, sampling processes or seasonal variability in groundwater conditions;
- > Assess any changes in concentrations of PFAS in groundwater migrating from source areas, and being abstracted from the underlying aquifer since the discontinued use of legacy Aqueous Film-Forming Foam (AFFF);
- > Assess seasonal fluctuations in the groundwater PFAS concentrations;
- > Characterise the stability of the reported PFAS plume in the superficial aquifer and understand the dynamics of groundwater migration pathways around the perimeter of the site;
- > Fulfil the recommendations outlined in the PFAS Management Area Plan (PMAP) to provide supporting data to inform the ongoing management requirements for the impacted superficial aquifer.

The purposes of the Annual Interpretive Report are to:

- > Inform Defence and key stakeholders of PFAS trends in groundwater and tap water;
- > Assess any variations in the distribution of PFAS for the site and how this changes the understanding of the conceptual site model and risk profile;
- > Confirm the monitoring has met the objectives of the Sampling and Analysis Quality Plan (SAQP) and overall OMP; and
- > Identify if a review of the OMP is required.

1.3 Scope of Work

The OMP was carried out between September 2020 and August 2021 in accordance with the scope and limitations presented in Cardno's Sampling and Analysis Quality Plan (SAQP), Appendix B:

- > Cardno, 15 June 2021, Reference: DEF19009, 'PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Gingin Satellite Airfield'.

The SAQP was reviewed prior to each monitoring event and amended if required.

The assessment included the following main components:

1. Biannual monitoring (gauging and sampling) of all on-site groundwater wells;
2. Sampling from selected taps and abstraction bores at the site on a quarterly basis;
3. Monitoring of selected off-site groundwater monitoring wells and abstraction bores on a quarterly basis, specifically:
 - i. Two Water Corporation production bores (Pinjar Production Bore P145 and P140)³; and
 - ii. Four shallow groundwater monitoring wells located between the Water Corporation bores and the site boundary.

Biannual sampling was undertaken post-winter (October 2020), and post-summer (April 2021) with additional quarterly events in January 2021 and July 2021.

1.4 Standards of Assessment and Limitations

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

This report is not any of the following:

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

³ Sampled by the Water Corporation and results provided to the Department of Defence.

2 Site Setting

Gingin Satellite Airfield is located approximately 55 km north of Perth within the suburb of Yeal and approximately 15 km southwest of Gingin town centre and covers an area of approximately 706 hectares (ha).

The site has operated as a Satellite Airfield since the mid-1960s and is used by the RAAF and visiting allied forces to support flying training. The RAAF operations includes firefighting services, operated by a Defence contractor, Broadspectrum (now Ventia). There is a Fire House located on-site which includes a fire response vehicle. The majority of the buildings and associated infrastructure and support services include:

- > Powerhouse and associated transformers and fuel infrastructure;
- > Pump house and associated water supply infrastructure;
- > Former fuel farm compound (decommissioned);
- > Fire house and adjoining vehicle refuelling area;
- > Vehicle wash down bay;
- > Runway, taxiways and air traffic control tower;
- > Aircraft hangers;
- > Administration and change rooms / crew huts (for pilots);
- > Caretaker's accommodation;
- > Asset services yard compound;
- > Buildings formerly used by Pearce Flying Club (vacated); and
- > Radio tower and associated buildings.

2.1 Site Definition and Planning

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

Table 2-1 Site Identification Details

Details	Description
Site Address	1 Airfield Road, Yeal, WA, 6503
Land Description	RAAF Satellite Airfield
Owner	Commonwealth of Australia
Title Details	Lot 1 on Deposited plan 49337 / Certificate of Title 192/157A
Planning Zone/Land use	Public Purposes – Government Services
Local Government Authority (LGA)	Shire of Gingin and City of Wanneroo

Source: Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.

2.2 Surrounding Land Uses and Zoning

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

Table 2-2 Surrounding Land Uses

Direction	Land Use
North	Yeal Swamp Nature Reserve (including ephemeral wetlands)
East	<ul style="list-style-type: none"> Duffy Road Strawberry farms Hobby farm Broiler farms
South	Yeal Swamp Nature Reserve
West	Yeal Swamp Nature Reserve
Other	The Site is located within the boundary of the Gngangara Underground Water Pollution Control Area (UWPCA).

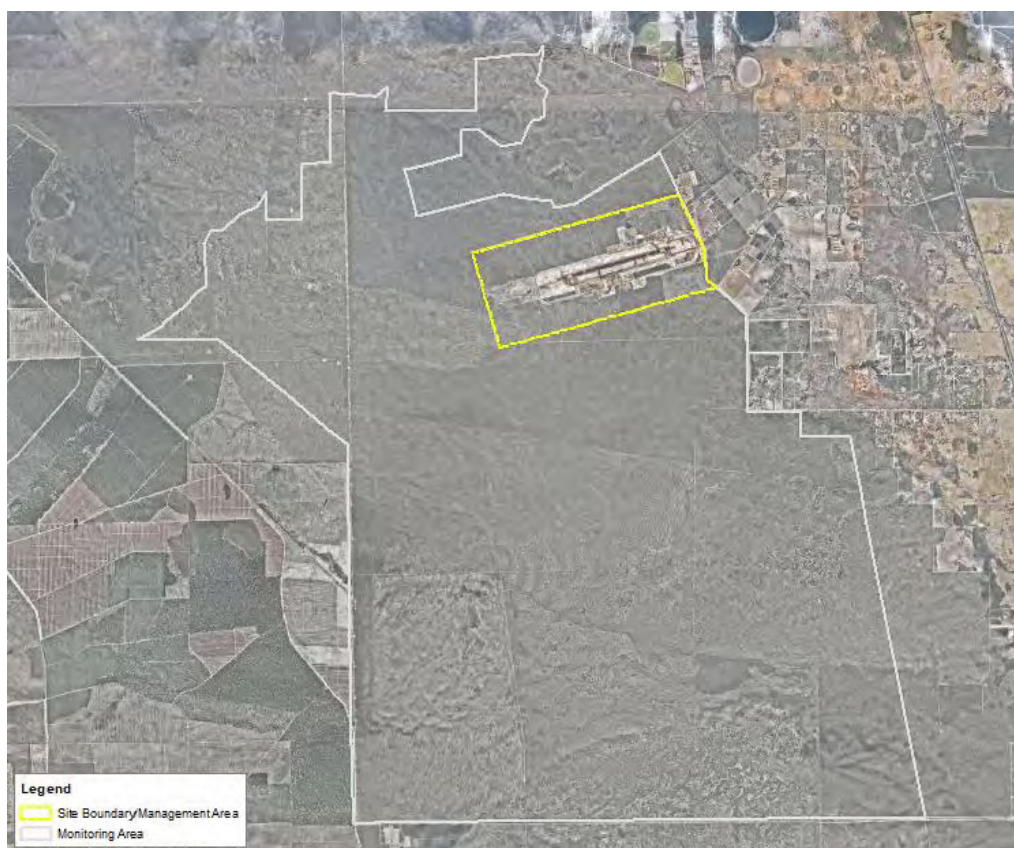
2.3 Monitoring Area Description

The OMP includes sampling and analysis not only from the site (Management Area), but also from a number of surrounding (off-site) groundwater monitoring wells (Monitoring Area). The Management Area is defined as the area for which active management of risks relating to PFAS contamination are required. The Monitoring Area is defined as the area where risks relating to PFAS contamination are currently considered to be acceptably low and therefore active management of these risks is not considered necessary.

For the purposes of this report:

- > The Management Area was defined as Gingin Satellite Airfield (Figure 1, Appendix A).
- > The Monitoring Area was defined as comprising the site, plus the parcel of Crown Land that represents the Yeal Swamp Nature Reserve (Figure 2-1).

Figure 2-1 Monitoring Area



2.4 Environmental Setting

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

Table 2-3 Key Site Details

Setting	Description
Climate	<p>The area has a Mediterranean climate with hot dry summers and cool, wet winters. The records held by the Bureau of Metrology (BoM) indicate that the highest volume of rainfall typically occurs during the month of July with a mean monthly rainfall amount of 124 mm (BoM, 2019). The mean annual rainfall is recorded as 639.8 mm.</p> <p>February is the hottest month with maximum and minimum temperatures being 31.6°C and 18.3°C respectively. By contrast, winters are cool with July average maximum and minimum temperatures being 18.4°C and 7.7°C respectively.</p>
Topography	<p>The topography across the site undulates and generally grades from west to east, however, the landform occupied by the Airfield has been substantially modified, regraded and levelled to accommodate the runway, infrastructure and buildings. Ground elevation generally ranges between approximately 75 – 80 m Australian Height Datum (AHD), with the runway at 75 mAHd.</p>
Geology	<p>Regional Geology</p> <p>The Airfield is located on the Swan Coastal Plain, which extends up to 36 km wide and is bounded by the Darling Fault and associated Darling Scarp to the east and the Indian Ocean to the west. The Bassendean Dune System lies beneath the site, which generally consists of calcareous sand with quartz sand. The sands inter-finger with the Guildford Clay to the east and overlies the Gnangara Sand. To the west, the sands are overlain by the Tamala Limestone.</p> <p>Site Specific Geology</p> <p>Soil logging was completed during the DSI undertaken by Jacobs in 2018. The core recovery showed the superficial aquifer to be primarily characterised as a fine to coarse grained sand or silty sand to the maximum depth of investigation being 56 m below ground level (mBGL).</p> <p>Multiple sandy silt units were identified during drilling, from approximately 9-10 mBGL, 14-16 mBGL, and 20 - 21 mBGL. The layers were of various thicknesses, ranging from 0.1 to 2.0 m thick, and locally discontinuous. These silts may act as local or partially confining layers.</p>
Acid Sulfate Soil	<p>A review of the Acid Sulphate Soils (ASS) risk mapping, available on the National Map online database indicates that the majority of the area encompassing the site is classified as having a low to moderate known ASS risk within 3.0 m of soil surface but high to moderate risk beyond 3.0 m of soil surface. There was one area in the northern portion of the site, and multiple surrounding areas that had identified a high to moderate risk of ASS occurring within 3.0 m of the natural soil surface (DWER, 2019).</p>
Hydrology	<p>There are no permanent surface water features located at the site. The closest water bodies to the site include:</p> <ul style="list-style-type: none"> ▪ Lake Bambun – approximately 3.0 km northeast, up hydraulic gradient. ▪ Bindjar Lake – approximately 7.2 km to the west, down hydraulic gradient. ▪ Lake Mungala – approximately 2.2 km to the northeast, up hydraulic gradient. ▪ Lake Nambung – approximately 2.2 km to the northeast, up hydraulic gradient. ▪ Gregadoo Creek – approximately 4.0 km to the northeast, up hydraulic gradient. <p>East of the Airfield is a dampland classified for conservation purposes (Jacobs, 2019d). Stormwater drainage from the site is conveyed towards the dampland via artificial channels. However, due to the sandy surface soil conditions, water readily infiltrates during rainfall events where off-site migration of stormwater occurs are rare.</p>
Hydrogeology	<p>Regional Hydrogeology</p> <p>The site is located on the Gnangara groundwater system, which covers approximately 2,200 km² along the coastal plain north of the Swan River to Gingin and east to the Darling Scarp. It comprises four main aquifers that are of relevance to the site:</p> <ul style="list-style-type: none"> ▪ The shallow, unconfined superficial aquifer (the Gnangara Mound); ▪ The semi-confined Mirrabooka aquifer; ▪ The deep, mostly confined Leederville aquifer; and ▪ The deepest, mostly confined Yarragadee aquifer.

Setting	Description
	<p>Groundwater Use</p> <ul style="list-style-type: none"> The Gngangara groundwater system is a crucial part of Perth's public water supply, but similarly supplies water for public open spaces, local agriculture and gardens (DWER, 2018). It also supports nationally significant groundwater-dependent ecosystems (GDEs), such as wetlands and Banksia woodlands. There are two abstraction bores located on the Airfield: <ul style="list-style-type: none"> Abstraction bore 1 is located adjacent to the former Caretaker's House. This bore is understood to intersect the Leederville aquifer. Since 2010 the bore has been active and now supplies two large water tanks (each 144 kL) which are used to supply a network of fire hydrants across the Airfield. Abstraction bore 2 is located within the Pump House compound and is understood to intersect the superficial aquifer. Groundwater from Abstraction bore 2 is extracted for non-potable use at the Airfield (including bathing, laundry, general site water supply, vehicle / equipment washdown and irrigation). Water from this bore is treated by a reverse osmosis unit and chlorine and more recently with a granular activated carbon filtration system following an upgrade of the water supply system. The site is situated within the boundary of the Gngangara UWPCA, the central area of the Gngangara groundwater system that provides public drinking water supply, as part of the Integrated Water Supply Scheme (IWSS). The Gngangara UWPCA covers an area of nearly 815 km² within the cities of Wanneroo, Swan and Stirling, and the shires of Gingin and Chittering (Water Corporation, 2007). The Water Corporation extract water from a large number of bores for the Perth Integrated Water Supply System. The closest to site include: <ul style="list-style-type: none"> Pinjar production bore P140 (reference code 61618216) located 7.3 km south-southwest of the site boundary. This bore is screened from 53 – 70 m bgl which is inferred to be in the superficial aquifer; Pinjar production bore P145 (reference code 61615123) located 7.3 km south-southwest of the site boundary. This bore is screened from 111 – 183 m bgl which is inferred to be in the Leederville aquifer. <p>Groundwater Elevation</p> <p>During the post-summer sampling event, groundwater elevations were recorded between 56.62 mAHD (MW128D) and 65.556 mAHD (MW303).</p> <p>Groundwater Flow</p> <p>The regional groundwater flow direction is expected to be predominantly towards the west. However, based on information collected during the post-summer event the inferred groundwater flow direction was interpreted as to the west-south-west, with a component of groundwater flow to the south observed in the southern portion of the site as displayed in Figure 4, Appendix A.</p>
Environmental Sensitive Areas	<ul style="list-style-type: none"> The Yeal Nature Reserve and Gngangara-Moore River State Forest to the north, south and west of the site are classified as protected areas. In addition, there are a number of smaller protection areas to the east of the site including the Timaru Nature Reserve, Breera Road Nature Reserve and Chandala Nature Reserve. Chandala Swamp is located approximately 7.0 km to the east of the site, at its closet point. There is a regional forest agreement approximately 15 km to the east of the site.

Further information can be found in the OMP (Defence, 2018a) and Jacobs DSI (Jacobs 2018c).

2.5 Source Areas

The primary PFAS Source Areas identified based on the previous investigation reports (refer to Figure 2, Appendix A) include the following:

- > SA01 - The former fuel farm together with a firefighting deluge system, the former fuel farm was located at the east of the main buildings. Previous reports indicated that PFAS contamination found could have resulted from periodic testing and maintenance of this system;
- > SA02 – The Firehouse and refuelling area located at the south of the taxiway. The refuelling area consisted of three above ground storage tanks (ASTs) connected to a series of fuel pumps. The firehouse was formerly used to store legacy AFFF and conduct maintenance of firefighting equipment. Indications

of high PFAS presence in this areas soils and groundwater could have been due to a combination of firefighting equipment testing and maintenance activities;

- > SA03 – The Powerhouse east of the firehouse and refuelling area. Although no records of AFFF use were reported around this building, elevated concentrations of PFAS were reported in soil and groundwater; and
- > SA04 - The eastern leach field located at the south of the firehouse. Wastewater contamination was found in this area from the sewerage system where water is disposed via an infiltration system. It is understood that PFAS contamination resulted from the historic use of this area for the testing of firefighting equipment, which involved the release of AFFF.

3 Sampling and Analytical Methodology

3.1 September 2020 - August 2021 Sampling Dates

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

Table 3-1 Summary of sampling dates

Sampling event	OMP activity	Sampling period
2020 post-winter biannual monitoring	Groundwater monitoring (sampling and gauging)	14 October to 29 October 2020
	Tap sampling	
First quarterly monitoring	Limited groundwater monitoring (sampling and gauging)	28 January 2021
	Tap sampling	
2021 post-summer biannual monitoring	Groundwater monitoring (sampling and gauging)	27 April to 28 April 2021
	Tap sampling	
Second quarterly monitoring	Limited groundwater monitoring (sampling and gauging)	15 July 2021
	Tap sampling	

3.2 Groundwater Sampling Network

Sampling of selected groundwater monitoring locations was generally performed in accordance with the SAQP (Cardno 2021, Appendix B), applying methods set out in Section 6.3.3 of the SAQP. The groundwater wells monitored as part of the OMP are presented in Table 3-2 and are shown on Figures 3A and 3B, Appendix A.

Table 3-2 Groundwater Monitoring Locations

Monitoring Area	Monitoring Well / Bore ID
On-site – Source Areas	Former fuel farm (SA01) - MW112S, MW113S, MW101I, MW102D, MW301, MW302, MW303
	Fire house and Refuelling area (SA02) - MW104I, MW105D, MW304, MW305, MW306, MW504
	Powerhouse (SA03) - MW307, MW308, MW309, MW310
	Landfills - MW106S, MW107S, MW108S, MW109S, MW110S
On-site – Secondary Sources	Sewage system and leach field (SA04): MW114S
	Site Drainage - MW115S
	Water Supply Infrastructure – MW312, MW313, MW111S, MW505
	Abstraction bore 1 - MW401
On-site - Other	Abstraction bore 2 –MW402
	Airside perimeter – MW116S, MW117I, MW118D, MW119S, MW120I, MW121D, MW122S, MW123I, MW124D
	Site boundary –MW125S, MW126I, MW128D, MW129S, MW130D, MW131S, MW132I, MW133D, MW134D, MW135I, MW136D, MW138S, MW139I, MW140D
	Background - MW137S
Off-site	Water Corporation Production bores ⁽¹⁾ : Pinjar Production P140, Pinjar Production P145
	Public land ⁽²⁾ : MW143S, MW142S, MW141S, MW403

Notes:

(1) These are being sampled by the Water Corporation.

(2) Yeal Swamp Nature Reserve managed by the Department of Parks and Wildlife (DPaW) / Vacant Crown Land managed by the Department of Planning, Lands and Heritage (DLPH)

3.3 Tap Water Sampling Locations

Tap water samples were collected from the monitoring locations listed in Table 3-3 and shown on Figures 3A and 3B, Appendix A. Sampling was conducted in accordance with the SAQP, applying methods set out in Section 6.4.2 of the SAQP (Cardno, 2021, Appendix B).

Table 3-3 Tap Water Monitoring Locations

Monitoring Area	Location ID
On-site	POT101; POT102; POT103; POT104 and POT105.

3.4 Deviations from the OMP SAQP

Table 3-4 below provides deviations from the OMP SAQP, including details on locations where samples could not be collected.

Table 3-4 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
2020 Post-Winter		
MW101I, MW107S, MW108S, MW111S, MW119, MW143S	Not sampled	These monitoring wells were found dry.
2021 Q1		
MW143S	Not Sampled	These monitoring wells were found dry.
MW402		Access denied by Broadspectrum, due to presence of Amoebae.
2021 Post-Summer		
MW108S, MW107S, MW111S, MW114S, MW134D, MW143S, MW403, MW305, MW306, MW308, MW309	Not Sampled	These wells were found dry
2021 Q3		
MW143S	Not Sampled	Well was found dry
MW402		Unable to unscrew pipe lid to collect sample.

3.5 Changes to the Monitoring Network Condition

During the previous monitoring period (September 2019 – August 2020) monitoring wells MW103S, MW124D, MW308 and MW311 were identified to be destroyed or damaged. These wells have subsequently been repaired or reinstated as follows:

- > MW103S re-installed (new ID: MW504).
- > MW124D repaired and re-surveyed.
- > MW308 repaired.
- > MW311 re-installed (new ID: MW505).

4 Quality Assurance / Quality Control

A detailed review of the Quality Assurance/Quality Control (QA/QC) aspects was completed during each monitoring event, outcomes are included within the factual reports presented in Appendix C.

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

5 Assessment Criteria

At the time of preparing this report, a number of guidance documents were available in Australia including:

- > National Health and Medical Research Council (NHMRC) 2019. Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
- > Heads of the Environmental Protection Authority (HEPA) 2020. PFAS National Environmental Management Plan (NEMP) Version 2.
- > Department of Health (DoH), 2019. Health Based Guidance Values for PFAS for use in site investigations in Australia. September 2019.

The adopted assessment criteria for groundwater and tap water are detailed in Table 5-1. It is noted that no ecological receptors have been identified, therefore no ecological criteria have been adopted.

Table 5-1 Criteria for Groundwater – Human Health

Location	Pathway	Analyte	Criteria	Comment / Reference
On and Off-site	Drinking Water	PFOS + PFHxS	0.07 µg/L	The values presented in the PFAS NEMP, 2020 are from DoH 2019, which published final health-based guidance values for PFAS for use in site investigations in Australia.
		PFOA	0.56 µg/L	
	Recreational Use	PFOS + PFHxS	2.0 µg/L	The values presented in the PFAS NEMP, 2020 are from NHMRC 2019, which published final health-based guidance values for PFAS for use in site investigations in Australia.
		PFOA	10 µg/L	

Notes:

PFOS – Perfluorooctane Sulfonate

PFOA – Perfluorooctanoic Acid

PFHxS – Perfluorohexanesulfonic acid

6 Contextual and Ancillary Information

6.1 Additional Analytical Data

All data available at the time of reporting on the ESdat database for each OMP monitoring location was utilised to form the basis of the interpretations and conclusions presented in this report, including historical investigations (PSI and DSI) results.

6.2 Remediation Projects

None observed.

6.3 Infrastructure Projects

No infrastructure projects that could affect the interpretation of monitoring results were undertaken at the site during the monitoring period. It is noted that the planned removal of buildings onsite will make some tap water monitoring locations redundant for future monitoring events. This will be captured in an updated SAQP for the 2022 monitoring period.

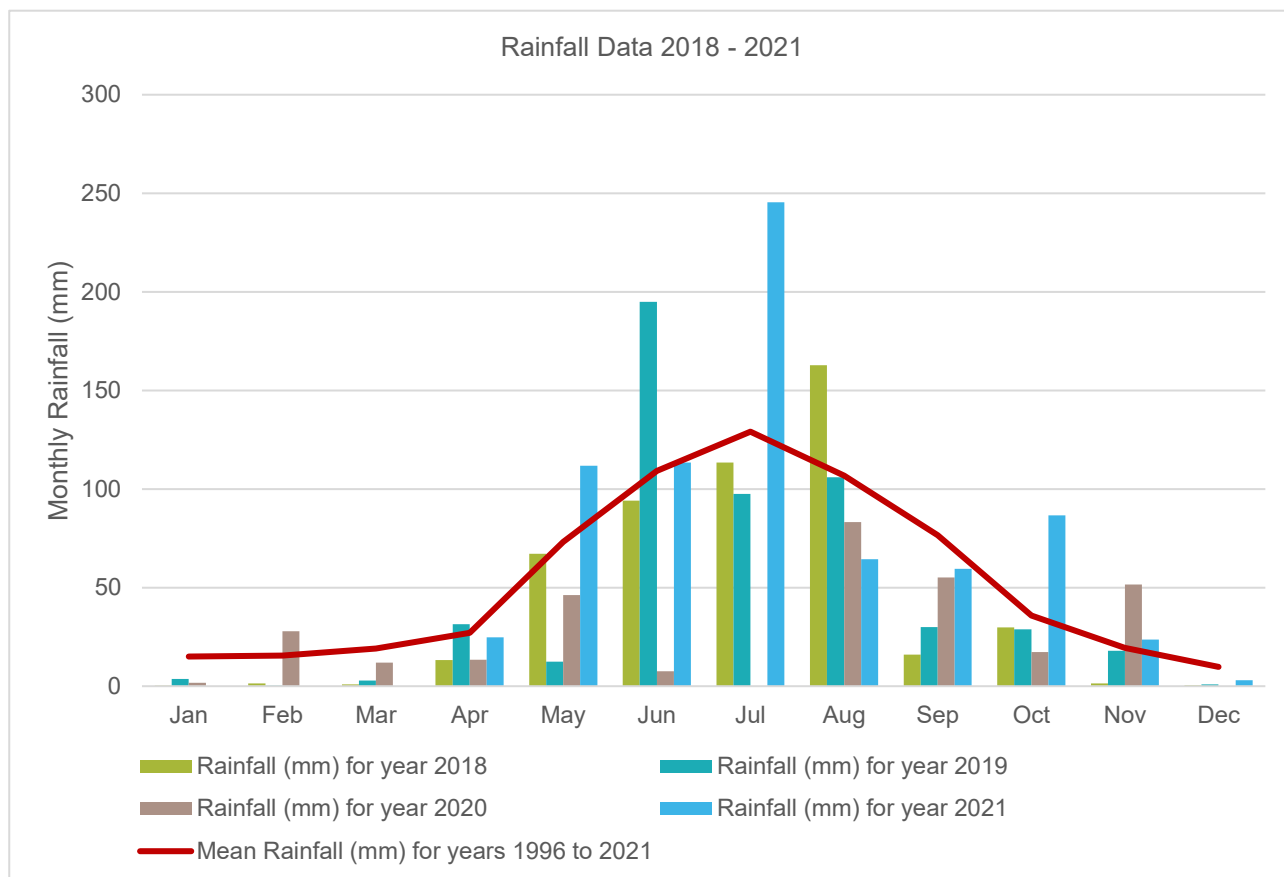
6.4 Climate

Rainfall is potentially the most significant meteorological factor that can influence PFAS migration. Monthly rainfall for all months between January 2018 and August 2021 [measured at Bureau of Meteorology (BoM) gauge 9178, Gingin Aero] are displayed in Figure 6-1.

It is noted during the September 2020 – August 2021 monitoring period that rainfall levels fluctuated above and below the mean rainfall, with July 2021 in particular recording a significantly higher than average rainfall total. Higher than average rainfall is likely to influence regional groundwater levels in the aquifer. These climatic conditions may result in changes to the hydrogeological system and manifest in a number of outcomes relevant to the monitoring of PFAS in the vicinity of the site. Changes may include groundwater gradients, groundwater flow directions and PFAS concentrations.

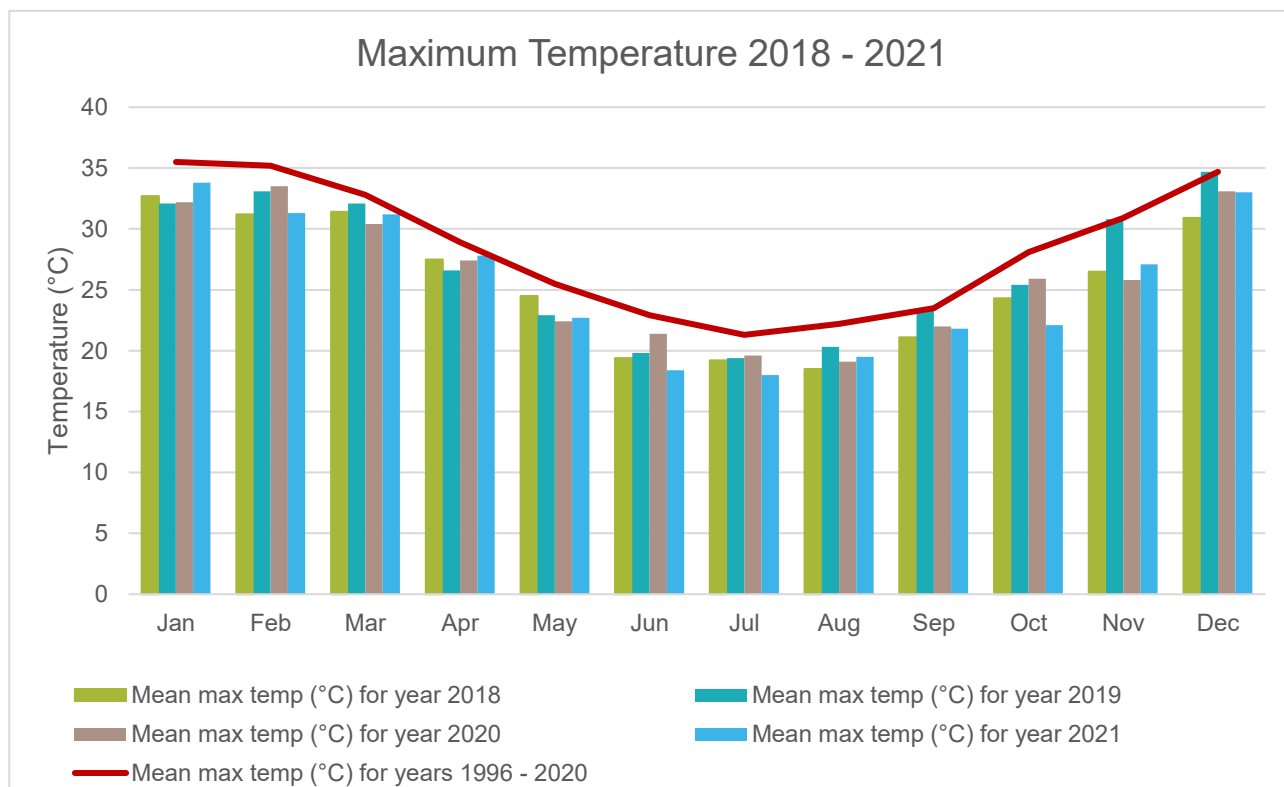
Monthly maximum mean temperatures recorded between 2018 and 2021 are consistent with mean monthly maximum results, with no significant variations recorded (Figure 6-2) (BoM, 2021).

Figure 6-1 Rainfall data 2018 – 2021 and Long -term Mean Monthly Rainfall for Gingin Aero (Station 9178) (BOM, 2021)



Note: No rainfall data was available from the BoM for July and December 2020 and January, February, and March 2021.

Figure 6-2 Monthly Mean Maximum Temperature 2018 – 2021 and Long-term for Gingin Aero (Station 9178) (BOM, 2021)



7 Monitoring Data Summary

7.1 Groundwater

Groundwater information is presented as follows:

- > A summary of field parameters recorded during the monitoring period is presented in Section 7.1.1, a consolidated table is provided within Appendix D;
- > Groundwater elevation data is summarised in Section 7.1.2, a gauging records table is provided within Appendix D;
- > Analytical results are summarised in Section 7.1.3 and consolidated tables are provided within Appendix D; and
- > Monitoring locations are presented in Figure 3A and Figure 3B (Appendix A).

7.1.1 Groundwater geochemical parameters

Groundwater geochemical parameters recorded during the post-winter 2020 and post-summer 2021 monitoring events are summarised in Table 7-1 and provided in Appendix D. Geochemical parameters recorded during the quarterly monitoring events have not been summarised below as only a limited amount of bores are monitored during these events.

Table 7-1 Groundwater Geochemical Parameters

Parameter	Post-winter 2020	Post-summer 2021
DO	0.79 mg/L (MW125) – 21.11 mg/L (MW142) <i>Aerobic conditions</i>	0.52 (MW124D) – 9.39 (MW112S) <i>Aerobic conditions</i>
EC	92.2 µS/cm (MW120) – 611 µS/cm (MW402)	61 µS/cm (MW504) – 676 µS/cm (MW140D)
TDS	59.8 mg/L (MW120) – 1001 mg/L (MW309) <i>Fresh to brackish conditions</i>	39.65 mg/L (MW504) – 442 mg/L (MW140D) <i>Fresh conditions</i>
pH	2.79 (MW106) – 6.89 (MW308) <i>Acidic to near neutral conditions</i>	3.41 (MW106S) – 9.62 (MW105D) <i>Acidic to alkaline conditions</i>
ORP	-134 mV (MW123) – 2,325 mV (MW114) <i>Reducing to oxidising conditions</i>	-62 mV (MW101I) – 337 mV (MW142S) <i>Reducing to oxidising conditions</i>

Groundwater geochemical parameters recorded during the September 2020- August 2021 monitoring period were comparable to historical field data range.

7.1.2 Groundwater elevations and migration contours

Groundwater gauging data measured during the October 2020 (post-winter) and April 2021 (post-summer) GMEs are presented within Appendix D. Inferred groundwater contours are presented on Figures 4 and 5, Appendix A. A summary is provided in Table 7-2. The groundwater characteristics are consistent with historical records.

Table 7-2 Groundwater Levels and Flow Direction

Item	Post-winter 2020	Post-summer 2021
Depths to groundwater	5.668 mbTOC (MW115S) – 22.286 mbTOC (MW136D)	6.17 mbTOC (MW115S) – 21.05 mbTOC (MW135I)
Groundwater elevation	52.696 mAHD (MW403) – 66.9645 mAHD (MW307)	56.62 mAHD (MW128D) – 65.556 mAHD (MW303)
Inferred direction of groundwater flow	Groundwater flow direction is inferred to flow from the site in a west-southwesterly direction, with wells in the southern portion of the site indicating a south direction, which is consistent with previous monitoring rounds.	
Seasonal difference in groundwater elevation	Groundwater levels were on average 0.43m shallower during the post-winter event	

The groundwater elevations and inferred contours and flow direction were consistent with historical data.

7.1.3 Groundwater results summary

7.1.3.1 On-site – Source Areas

Concentrations reported at monitoring wells within the on-site source areas were generally of the same order of magnitude as historical data (Table 7-3).

Table 7-3 On-site Source Area PFOA and Sum of PFOS and PFHxS Concentrations

Well ID		Sample Date				
Historical range		Oct-20	April-21	Historical range	Oct-20	April-21
PFOA (µg/L)				Sum of PFOS and PFHxS (µg/L) ¹		
Former Fuel Farm						
MW101I	<0.01 – 0.02	dry	<0.04	0.35 – 0.6	dry	0.25
MW102D	<0.01 - 0.01	0.01	0.01	<0.01 – 0.47	0.49	0.48
MW112S	<0.01	<0.01	<0.01	0.04 – 0.12	0.07	0.14
MW113S	<0.01	<0.01	<0.01	<0.01 - 0.06	0.01	0.02
MW301	0.02 - 1.6	1.24	1.32	0.12 - 86.2	40.5	37.6
MW302	<0.01 - 0.46	0.66	0.10	<0.01 – 8.3	7.04	1.51
MW303	0.68 – 3	0.8	1.16	46.9 – 88	21.6	82.8
Fire House and Refuelling Area						
MW504	0.25 – 0.71~	0.1	0.25	0.04 – 0.49~	3.39	6.9
MW104I	<0.01 – 0.06	<0.01	0.01	0.08 – 2.65	0.38	0.39
MW105D	<0.01 – 0.02	<0.01	0.08	<0.01 – 0.87	0.09	2.46
MW304	0.14 – 0.45	0.18	dry	6.69 – 41	4.6	dry
MW305	0.15 – 0.99	0.16	dry	4.1 – 6.86	4.54	dry
MW306	0.15 – 0.34	0.29	dry	5.8 – 7	5.97	dry
Powerhouse						
MW307	0.28-1.51	0.42	0.41	14.5 – 53	23.7	16.5
MW308	0.15 – 1.6	0.51	dry	46.2 - 47	22.9	dry
MW309	0.22 - 5.0	0.44	dry	42.2 - 271	23.6	dry
MW310	0.25 – 2.27	0.05	0.12	14.4 – 78.1	5.98	3.98
Landfills						
MW106S	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW107S	<0.01*	dry	dry	<0.01*	dry	dry
MW108S	<0.01*	dry	dry	<0.01*	dry	dry
MW109S	<0.01 - 0.16	<0.01	<0.01	0.25 - 5.7	0.36	0.49
MW110S	<0.01	<0.01	<0.01	0.01 - 0.05	0.14	0.09
New Maximum		New Minimum			New Exceedance	

Notes:

1. PFHxS were not analysed prior to 2018

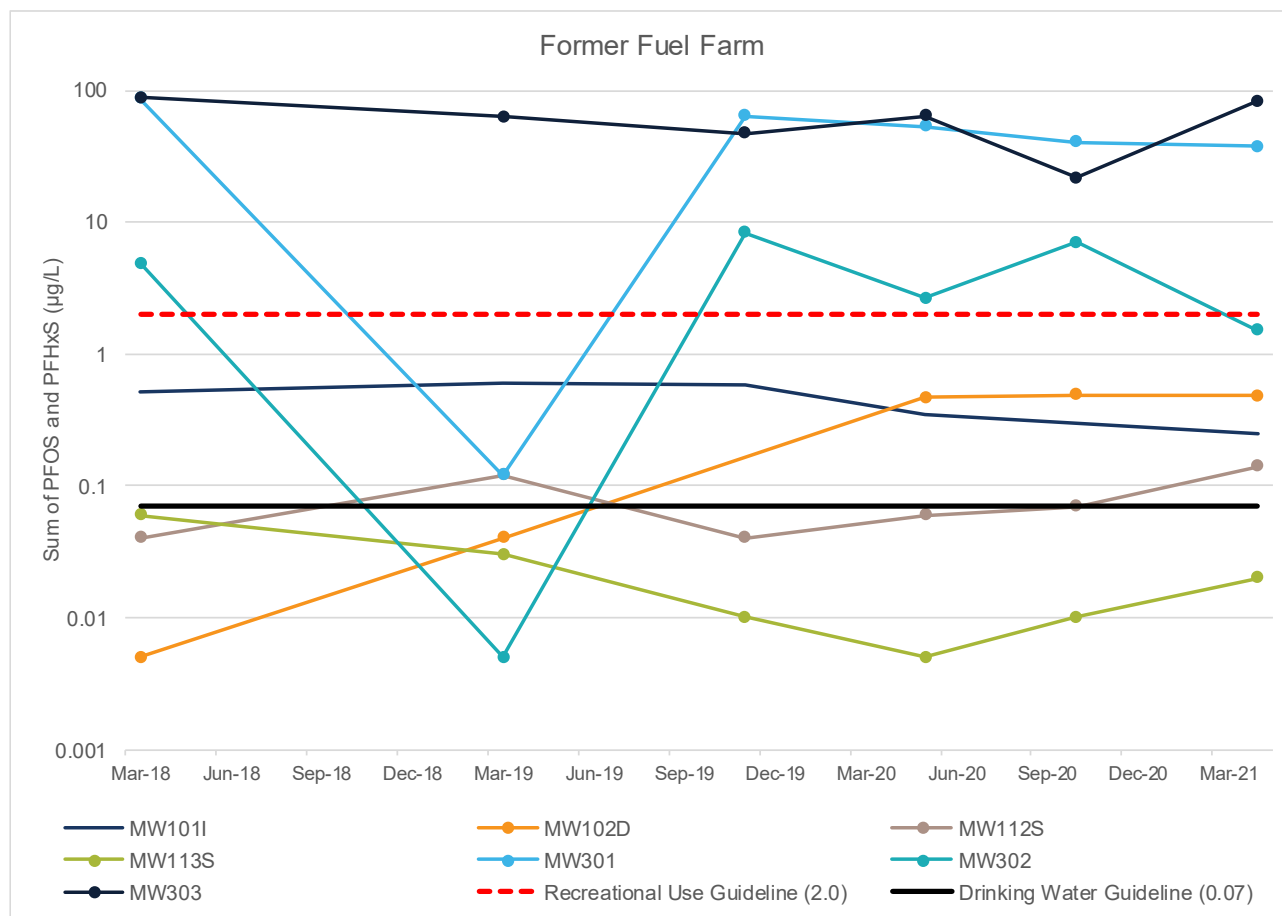
* Only sampled once in March 2018.

~Historical range for MW103S – MW504 is a replacement well for MW103S.

MW107S and MW108S (landfills) were found dry during the monitoring period. Upgradient well MW106S, also targeting the primary landfill, was able to be sampled. A number of wells around the firehouse and powerhouse were found dry (MW304, MW305, MW306, MW308, MW309) during the post-summer (April 2021) monitoring event. Data collected from downgradient wells MW310 and MW504 within the same source areas, will be used to inform the interpretative analysis.

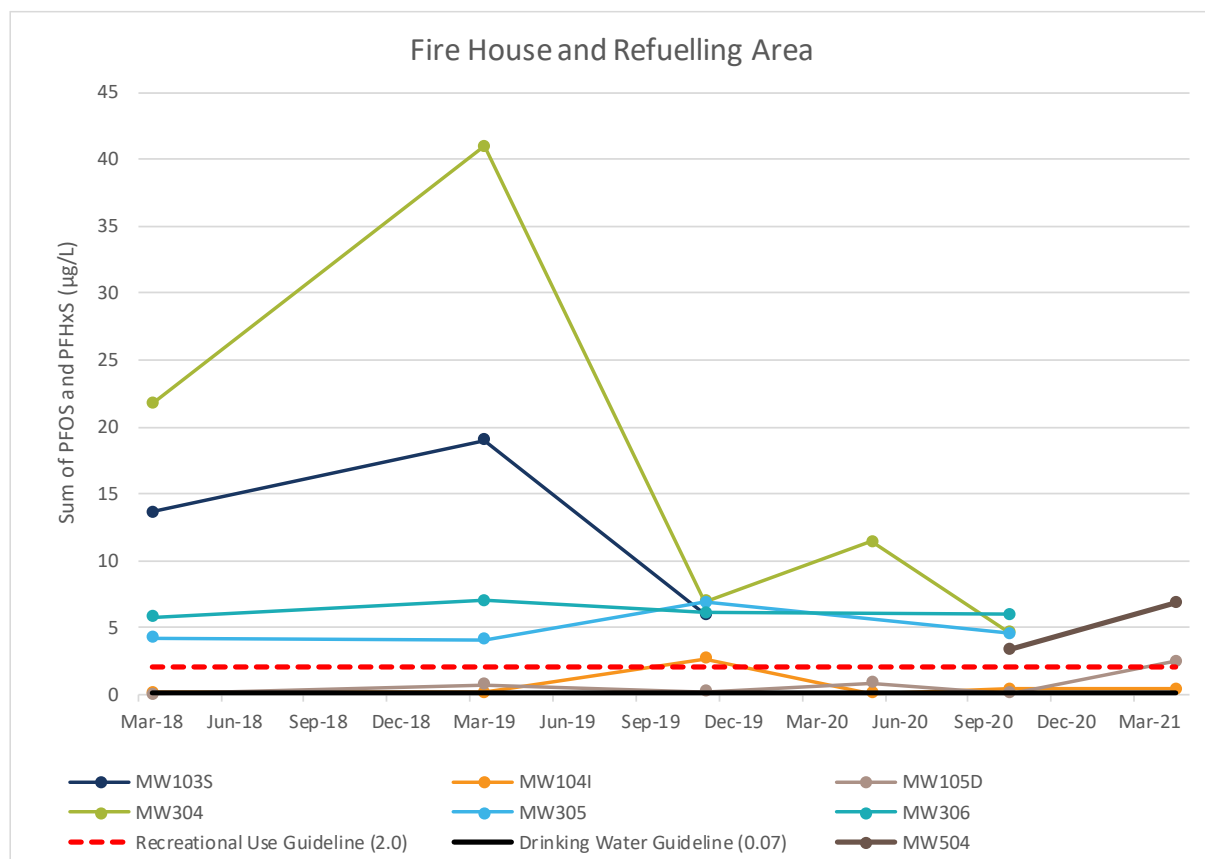
The sum of PFOS and PFHxS concentrations were predominantly higher across the monitoring network when in comparison to PFOA. Concentration trends for the sum of PFOS and PFHxS for the Former Fuel Farm, Fire House and Refuelling Area, the Powerhouse and the Landfills are presented in Figure 7-1 to Figure 7-4.

Figure 7-1 Former Fuel Farm Area Sum of PFOS and PFHxS Concentration Trends



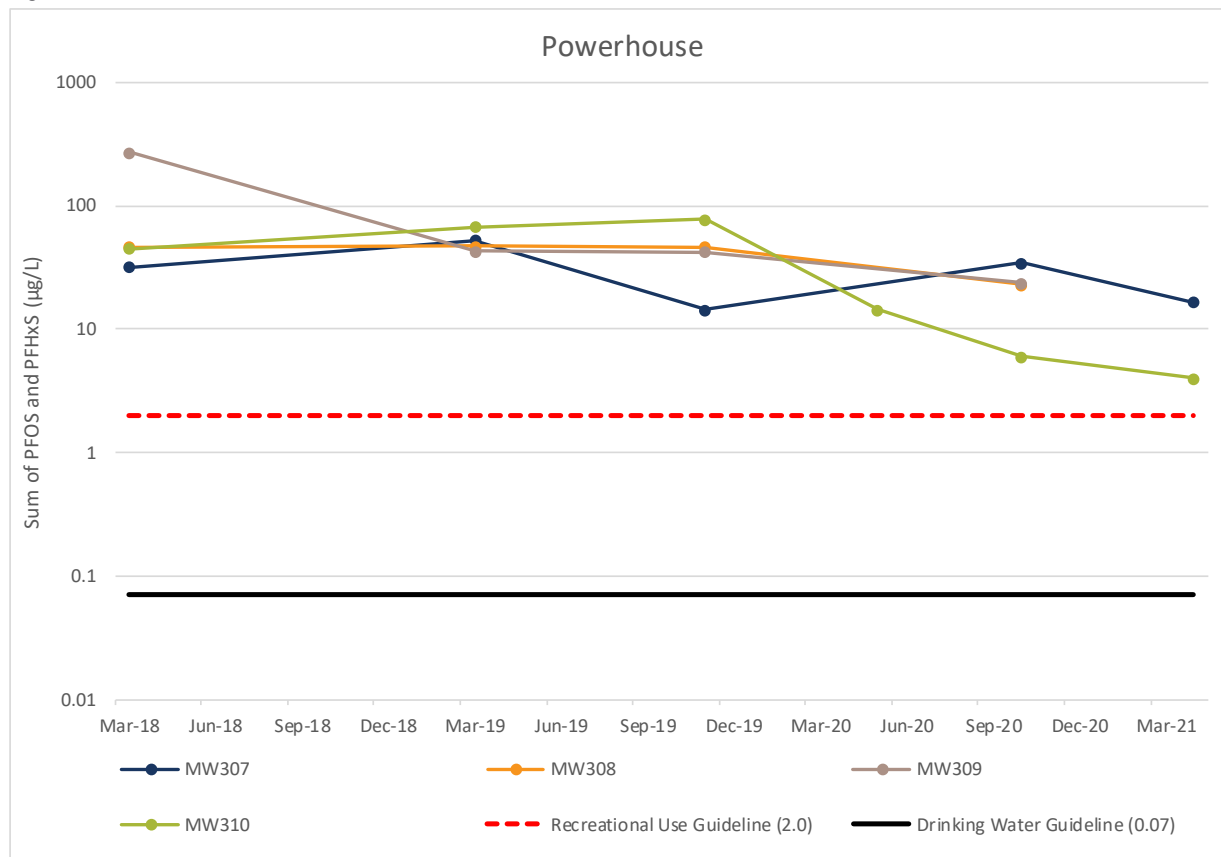
Notes: A logarithmic scale is used for the vertical axis. Non-detectable concentrations were replaced by half of the LOR value (0.005 µg/L)

Figure 7-2 Fire House and Refuelling Area Sum of PFOS and PFHxS Concentration Trends



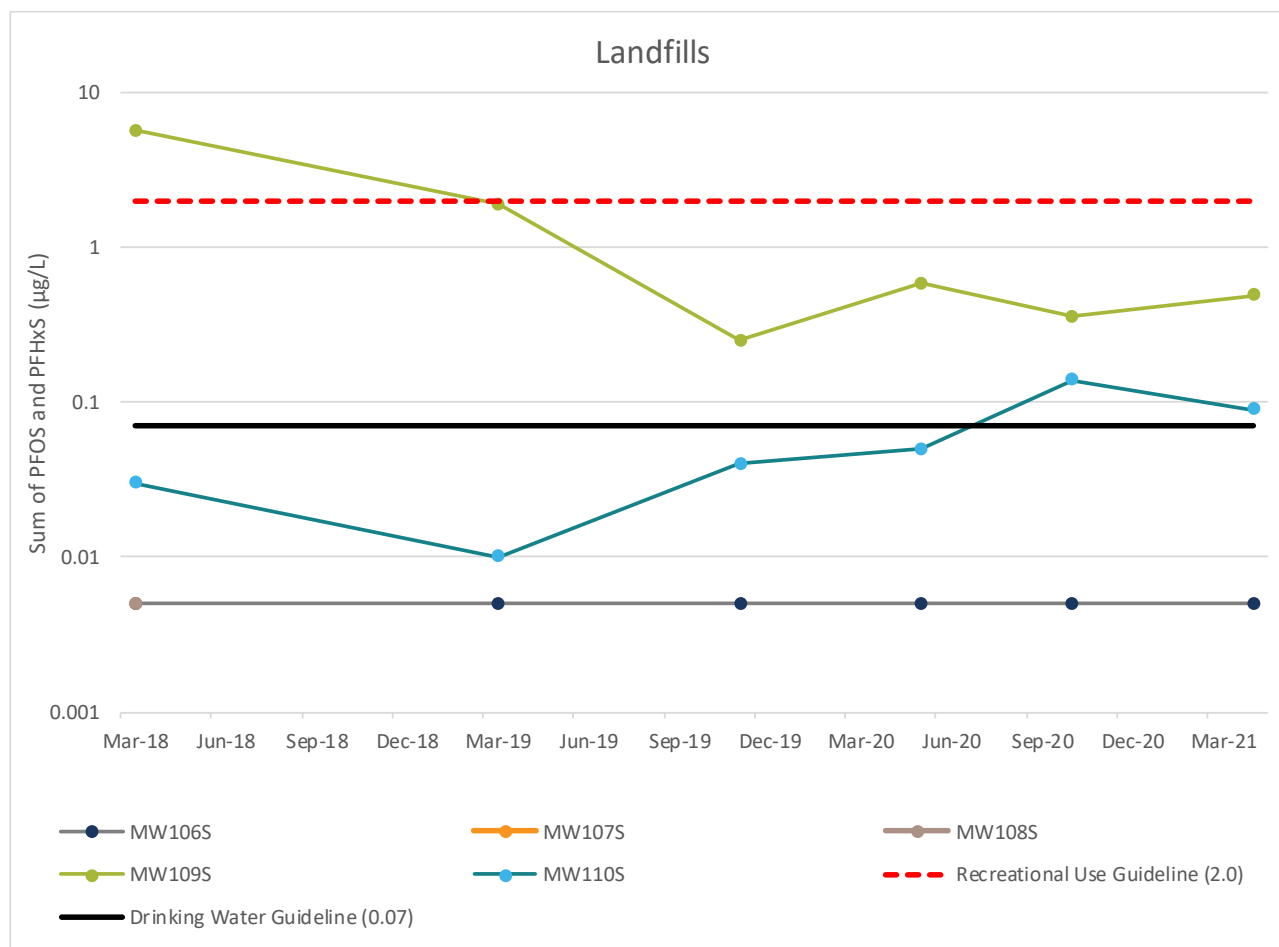
Note: Non-detectable concentrations were replaced by half of the LOR value (0.005 µg/L)

Figure 7-3 Powerhouse Sum of PFOS and PFHxS Concentration Trends



Notes: A logarithmic scale is used for the vertical axis

Figure 7-4 Landfills Sum of PFOS and PFHxS Concentrations Trends



Notes: A logarithmic scale is used for the vertical axis. Non-detectable concentrations were replaced by half of the LOR value (0.005 µg/L)

7.1.3.2 On-site – Secondary Sources

There are five areas identified as on-site Secondary Sources, the well details associated with each source area are provided below:

- > Sewage system and leach field (SA04): MW114S;
- > Site Drainage - MW115S;
- > Water Supply Infrastructure –MW505, MW312, MW313, MW111S;
- > Abstraction bore 1 - MW401; and
- > Abstraction bore 2 – MW402.

All wells recorded PFOA concentrations below the adopted HEPA (2020) PFAS NEMP Human Health Drinking Water and Recreational Water guidelines.

Concentrations for the sum of PFOS and PFHxS across the Secondary Source areas during the September 2020 to August 2021 monitoring events reported a number of new minimums at MW114S, MW115S, MW505, and MW402.

The number of wells recording the sum of PFOS and PFHxS concentrations above the adopted criteria is considered largely consistent, however, it is noted that MW111S and MW311 had historically recorded concentrations above adopted drinking water guidelines and were not sampled in the September 2020 – August 2021 monitoring period.

A significant increase in Sum of PFHxS and PFOS concentration was observed at MW312 from 1.23 µg/L in October 2020 to 3.25 µg/L in April 2021, exceeding the recreational water criterion. It is noted that this is not a new maximum, as a concentration of PFOS of 17.2 µg/L was reported at this well in August 2015 and 3.3 µg/L was reported in November 2016 (PFHxS concentration was not reported before 2018).

The results for PFOA and the sum of PFOS and PFHxS for the on-site Secondary Source areas are displayed in Table 7-4.

Table 7-4 On-site Secondary Source Areas PFOA and Sum of PFOS and PFHxS Concentrations

Well ID		Sample Date								
	Historical Range	Oct-20	Jan-21	Apr-21	Jul-21	Historical Range	Oct-20	Jan-21	Apr-21	Jul-21
PFOA (µg/L)						Sum of PFOS and PFHxS (µg/L) ¹				
MW111S	0.06*	dry	NS	dry	NS	2.39*	dry	NS	dry	NS
MW114S	0.02 – 0.03	<0.01	NS	dry	NS	1.74 – 1.8	0.78	NS	dry	NS
MW115S	<0.01	<0.01	NS	<0.01	NS	0.11 - 0.16	0.08	NS	0.01	NS
MW505	0.02 – 0.09~	<0.01	NS	0.03	NS	0.08 - 3.4~	0.14	NS	1.5	NS
MW312	0.02 – 1.06	0.03	NS	0.05	NS	0.98 – 17.2	1.23	NS	3.25	NS
MW313	<0.01 – 1.64	<0.01	NS	0.02	NS	0.13 – 20.9	0.13	NS	0.87	NS
MW401	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW402	0.02 - 0.04	0.03	NS	0.02	NS	0.82 – 2.26	0.77	NS	0.8	NS
New Maximum			New Minimum				New Exceedance			

Notes:

1. PFHxS were not analysed prior to 2018.

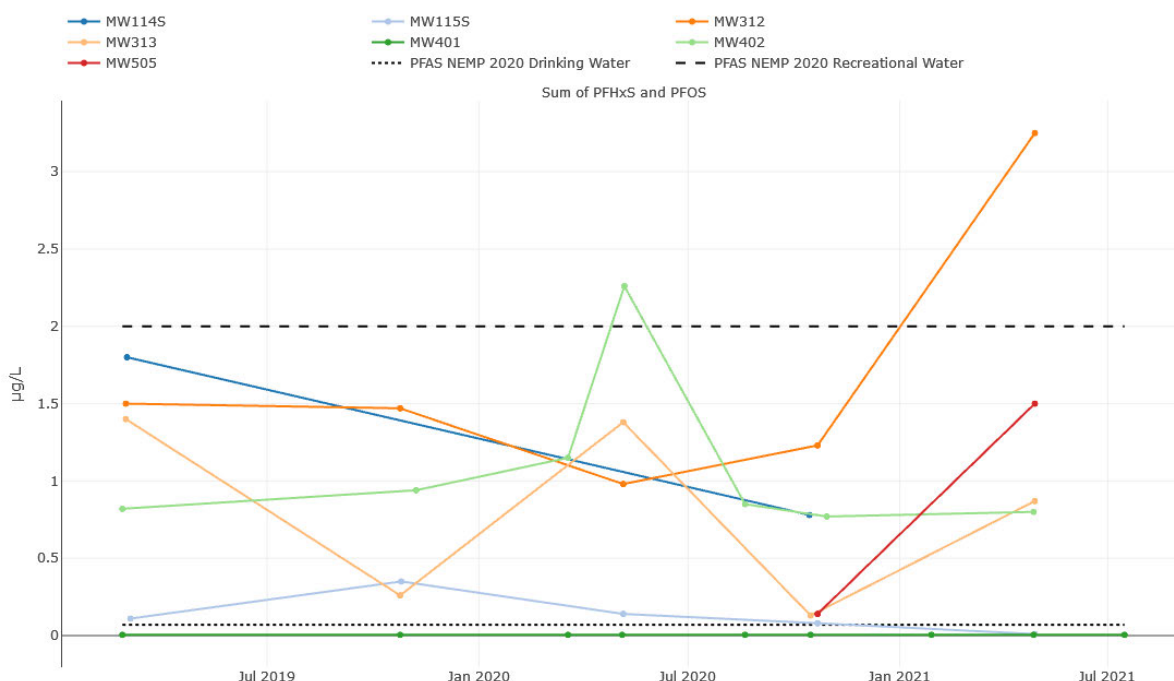
NS – Not sampled

* only previously analysed in March 2018

~Historical range for MW311 – MW505 is a replacement well for MW311.

A concentration trend graph for the sum of PFOS and PFHxS for the on-site Secondary Source areas is presented in Figure 7-5.

Figure 7-5 On-site Secondary Source Areas Sum of PFOS and PFHxS Concentration Trends



Note: Non-detectable concentrations were replaced by half of the LOR value (0.005 µg/L)

7.1.3.3 On-site – Other

This well network consists of:

- > On-site inner perimeter wells: MW116S, MW117I, MW118D, MW119S, MW120I, MW121D, MW122S, MW123I, MW124D;

- > On-site boundary wells: MW125S, MW126I, MW128D, MW129S, MW130D, MW131D, MW132I, MW133D, MW134D, MW135I, MW136D, MW138S, MW139I, MW140D; and
- > A singular off-site 'background well': MW137S.

Concentrations reported across the boundaries well network during the September 2020 to August 2021 monitoring events were generally consistent (i.e. within the same order of magnitude) with historical ranges. Monitoring wells MW117I, MW119S, MW123I (inner perimeter) and MW132I (on-site boundary) reported a new minimum sum of PFOS and PFHxS concentration, while MW137S reported a first time detection of PFOS and PFHxS concentration.

The drinking water criterion for sum of PFOS and PFHxS was exceeded at MW116S, MW123I and MW138S. There were no exceedances of the recreational criterion. There were no PFOA concentrations detected above the laboratory LOR for the perimeter or background wells.

The results for PFOA and the sum of PFOS and PFHxS are displayed in Table 7-5.

Table 7-5 On-site Other Areas PFOA and Sum of PFOS and PFHxS Concentrations

Well ID	Sample Date					
	Historical Range	Oct-20	Apr-21	Historical Range	Oct-20	Apr-21
	PFOA (µg/L)			Sum of PFOS and PFHxS (µg/L)		
Inner Perimeter						
MW116S	<0.01	<0.01	<0.01	<0.01 - 0.08	0.07	0.04
MW117I	<0.01	<0.01	<0.01	0.01 - 0.02	<0.01	0.03
MW118D	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW119S	<0.01	dry	<0.01	0.04 - 0.07	dry	0.02
MW120I	<0.01	<0.01	<0.01	<0.01 – 0.02	<0.01	<0.01
MW121D	<0.01	<0.01	<0.01	<0.01 – 0.02	<0.01	<0.01
MW122S	<0.01	<0.01	<0.01	<0.01 – 0.03	0.02	<0.01
MW123I	<0.01	<0.01	<0.01	0.12 - 0.24	0.09	0.13
MW124D	<0.01	<0.01	<0.01	<0.01 – 0.02	<0.01	<0.01
On-site Boundary						
MW125S	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW126I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW128D	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW129S	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW130D	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW131S	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW132I	<0.01	<0.01	<0.01	0.02 – 0.06	<0.01	<0.01
MW133D	<0.01	<0.01	<0.01	<0.01 – 0.04	0.03	0.04
MW134D	<0.01	<0.01	NS	<0.01	<0.01	NS
MW135I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW136D	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW138S	<0.01 – 0.01	<0.01	<0.01	0.21 - 0.44	0.27	0.23
MW139I	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW140D	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Background						
MW137S	<0.01	<0.01	<0.01	<0.01	0.02	<0.01

Well ID		Sample Date	
New Maximum		New Minimum	New Exceedance
Notes:			
1. PFHxS were not analysed prior to 2018.		NS – Not sampled	

Based on the concentrations recorded being mostly below LOR, a trend graph has not been developed for the boundary's wells.

7.1.3.4 Off-site

There are three monitoring wells (MW141S, MW142S and MW143S) located to the south-southwest of the site that are monitored quarterly as part of the OMP. These wells provide an indication of any change in the nature or magnitude of PFAS migrating off-site (if any), and the data is used to assess seasonal fluctuations and recommend management measures if required. The DWER bore MW403 located further south of the site is also monitored quarterly to provide an early indication of PFAS migrating off-site (if any).

Concentrations reported across the well network during the September 2020 – August 2021 monitoring events were generally consistent with the 2020 results, with the exception of MW141S that recorded a new minimum concentration for the sum of PFOS and PFHxS of 0.42 µg/L in October 2020. This location is also the only off-site well consistently detecting results above the adopted HEPA (2020) PFAS NEMP Human Health Drinking Water criterion. MW143S was found dry during all monitoring events of the monitoring period and MW142S and MW403 reported PFAS concentrations below the laboratory LOR.

All PFOA concentrations were recorded below the adopted HEPA (2020) PFAS NEMP Human Health Drinking Water and Recreational Water guidelines.

The Department of Defence has been advised that the Water Corporation has undertaken sampling for PFAS at production bores Pinjar bore 140 (Superficial aquifer) and Pinjar bore 145 (Leederville aquifer) on a quarterly basis since March 2020. The Water Corporation have advised that, to date, PFAS concentrations reported in groundwater have been below the Australian Drinking Water Guidelines 2011 (as amended March 2021).

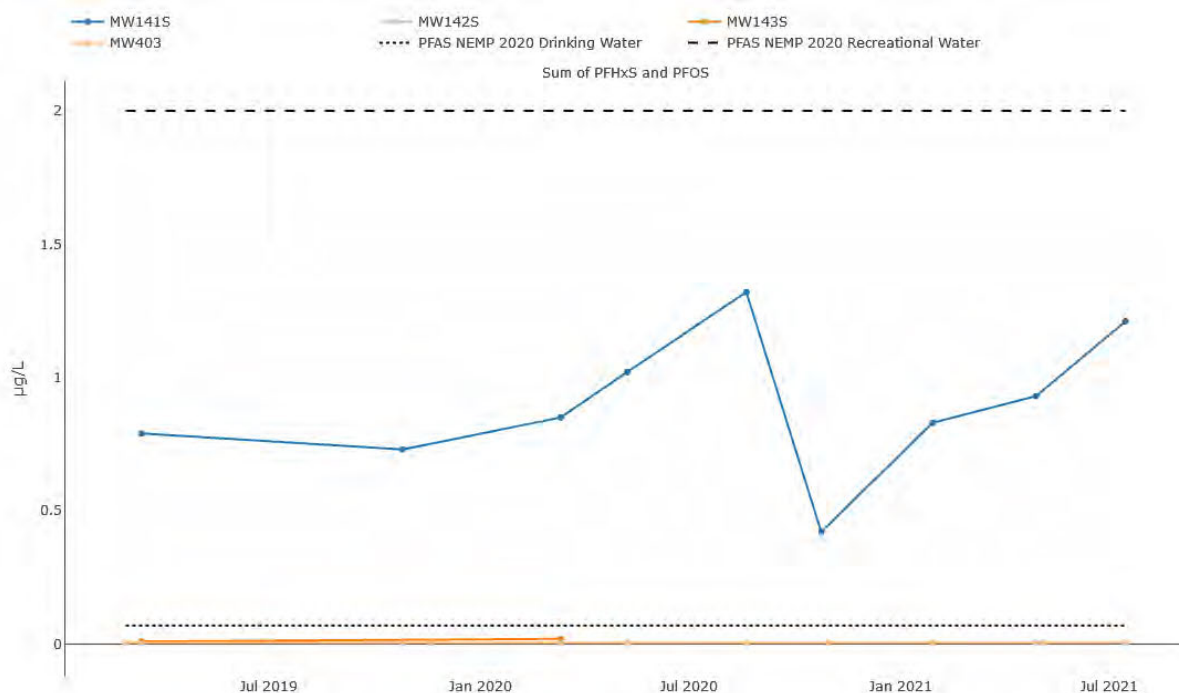
The results for PFOA and the sum of PFOS and PFHxS are displayed in Table 7-6.

Table 7-6 Off-site PFOA and Sum of PFOS and PFHxS Concentrations

Well ID		Sample Date								
	Historical Range	Oct-20	Jan-21	Apr-21	Jul-21	Historical Range	Oct-20	Jan-21	Apr-21	Jul-21
PFOA (µg/L)						Sum of PFOS and PFHxS (µg/L)				
MW141S	0.02 – 0.05	0.02	0.04	0.04	0.04	0.73 – 1.32	0.42	0.83	0.93	1.21
MW142S	<0.01 - <0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW143S	<0.01 – 0.01	dry	dry	dry	dry	0.01 – 0.02	dry	dry	dry	dry
MW403	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
New Maximum			New Minimum				New Exceedance			

A concentration trend graph for the sum of PFOS and PFHxS for the off-site wells is presented in Figure 7-6.

Figure 7-6 Off-site wells Sum of PFOS and PFHxS Concentration trends



Note: Non-detectable concentrations were replaced by half of the LOR value (0.005 µg/L)

7.1.4 Major Ions Analysis

Major ions analysis was conducted on the groundwater samples collected during each monitoring event to categorise the water type. The results of the major ion analysis are visually represented in a Piper Diagram shown in Figure 7-7.

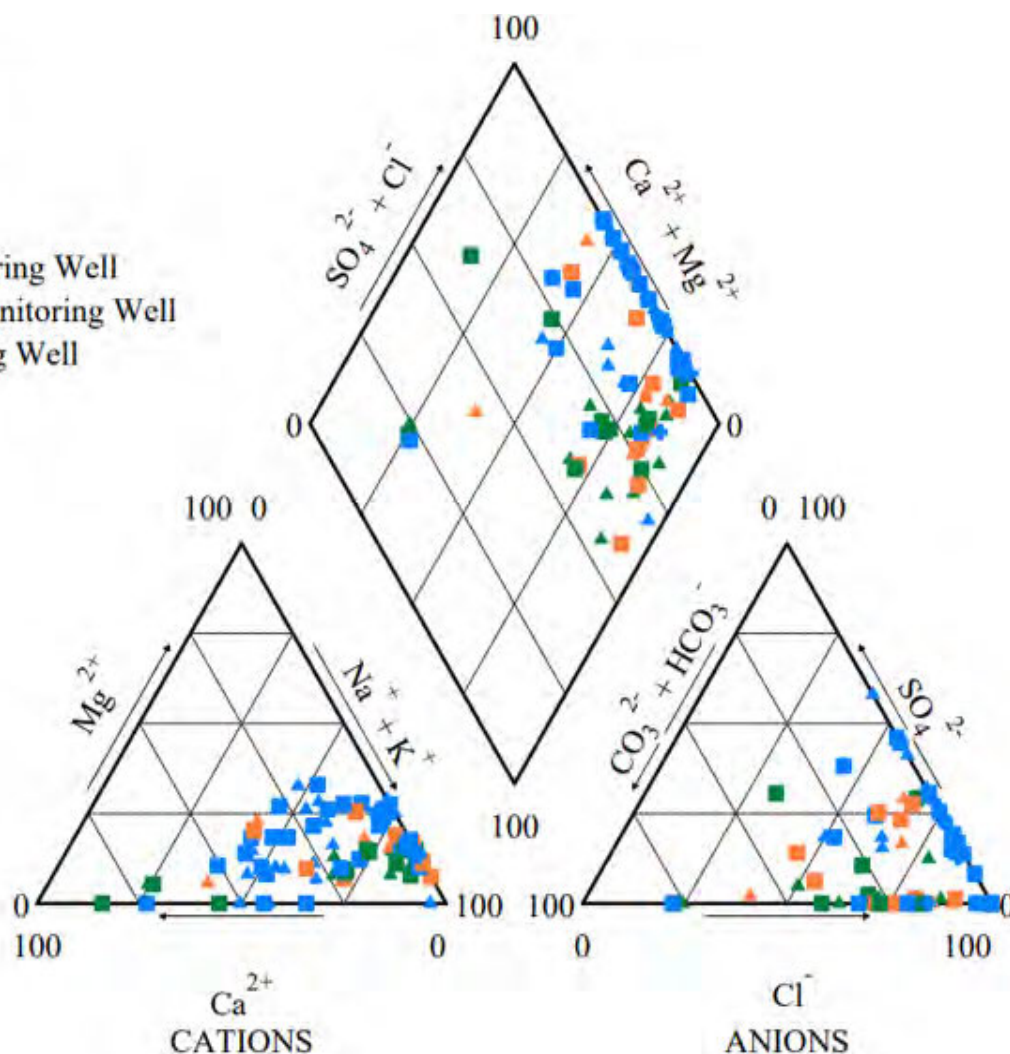
With the exception of a few outliers, the hydrochemistry of each aquifer is generally consistent between each sampling event and with historical data:

- > Groundwater in the shallow intermediate and deep aquifers were generally a sodium-chloride water type.
- > The shallow groundwater appeared to have a greater presence of calcium, magnesium and sulphate than the intermediate and deep groundwater.

Figure 7-7 Piper Diagram – Groundwater samples

Legend

- ▲ October 2020
- January 2021
- April 2021
- ◆ July 2021
- ▲ Shallow Monitoring Well
- ▲ Intermediate Monitoring Well
- ▲ Deep Monitoring Well



7.2 Tap Water

7.2.1 Tap water geochemical parameters

Tap water geochemical parameters recorded during the biannual and quarterly monitoring events are summarised in Table 7-7 and provided within Appendix D.

Table 7-7 Tap water Geochemical Parameters

Parameter	Post-winter 2020	Q1 2021	Post-summer 2021	Q3 2021
EC	524 µS/cm (POT104) – 551 µS/cm (POT102)	514 µS/cm (POT101) – 617 µS/cm (POT103)	275.5 µS/cm (POT101) – 710 µS/cm (POT104)	328.4 µS/cm (POT105) – 639 µS/cm (POT104)
TDS	351 mg/L (POT104) – 364 mg/L (POT101) <i>Fresh conditions</i>	234 mg/L (POT101) – 315 mg/L (POT103) <i>Fresh conditions</i>	179.4 mg/L (POT101) – 461.5 mg/L (POT104) <i>Fresh conditions</i>	213.2 mg/L (POT105) – 416 mg/L (POT104) <i>Fresh conditions</i>
pH	6.2 (POT102) – 7.76 (POT101) <i>Slightly Acidic to neutral conditions</i>	6.44 (POT101) – 7.17 (POT102) <i>Slightly Acidic to neutral conditions</i>	6.41 (POT101) – 7.51 (POT102) <i>Slightly Acidic to neutral conditions</i>	5.94 (POT101) – 6.34 (POT103) <i>Acidic to slightly acidic conditions</i>
ORP	190.9 mV (POT102) – 358.9 mV (POT103) <i>Oxidising conditions</i>	142 mV (POT101) – 227 mV (POT105) <i>Oxidising conditions</i>	22.3 mV (POT101) – 151.5 mV (POT104) <i>Oxidising Conditions</i>	214.7 mV (POT101) – 630.3 mV (POT103) <i>Oxidising conditions</i>

7.2.2 Tap water results summary

The tap water analytical results are provided in table 1, Appendix D.

New concentration maximums for PFOA were reported in July 2021 at all tap water sampling locations with exception of POT101. There were no PFOA exceedances of the drinking water or recreational water criteria.

New maximum concentrations for the sum of PFOS and PFHxS were reported in July 2021 at all tap water sampling locations. A new minimum concentration was also reported at POT103 in January 2021. All tap water results for the monitoring period were above the adopted HEPA (2020) PFAS NEMP Human Health Drinking Water guidelines, but below the recreational guidelines. This is consistent with historical records.

The results for PFOA and the sum of PFOS and PFHxS are displayed in Table 7-8.

Table 7-8 Tap Water PFOA and Sum of PFOS and PFHxS Concentrations

ID	Sample Date									
	Historical Range	Oct-20	Jan-21	Apr-21	Jul-21	Historical Range	Oct-20	Jan-21	Apr-21	Jul-21
PFOA (µg/L)					Sum of PFOS and PFHxS (µg/L)					
POT101	0.02 – 0.03	0.02	0.02	0.03	0.03	0.52 – 0.89	0.6	0.67	0.81	0.97
POT102	<0.01 – 0.03	0.02	0.03	0.03	0.04	0.06 – 0.98	0.64	0.75	0.88	1.16
POT103	0.01 – 0.03	0.02	0.01	0.02	0.04	0.5 – 0.94	0.5	0.25	0.61	1.03
POT104	<0.01 – 0.03	0.03	0.03	0.03	0.05	0.8 – 0.98	0.87	0.8	0.96	1.28
POT105	0.02 – 0.03	0.02	0.02	0.03	0.05	0.59 – 0.98	0.76	0.69	0.89	1.09
New Maximum		New Minimum					New Exceedance			

A concentration trend for the sum of PFOS and PFHxS for Tap Water samples is presented in Figure 7-8.

Figure 7-8 Tap water Sum of PFOS and PFHxS Concentration Trends



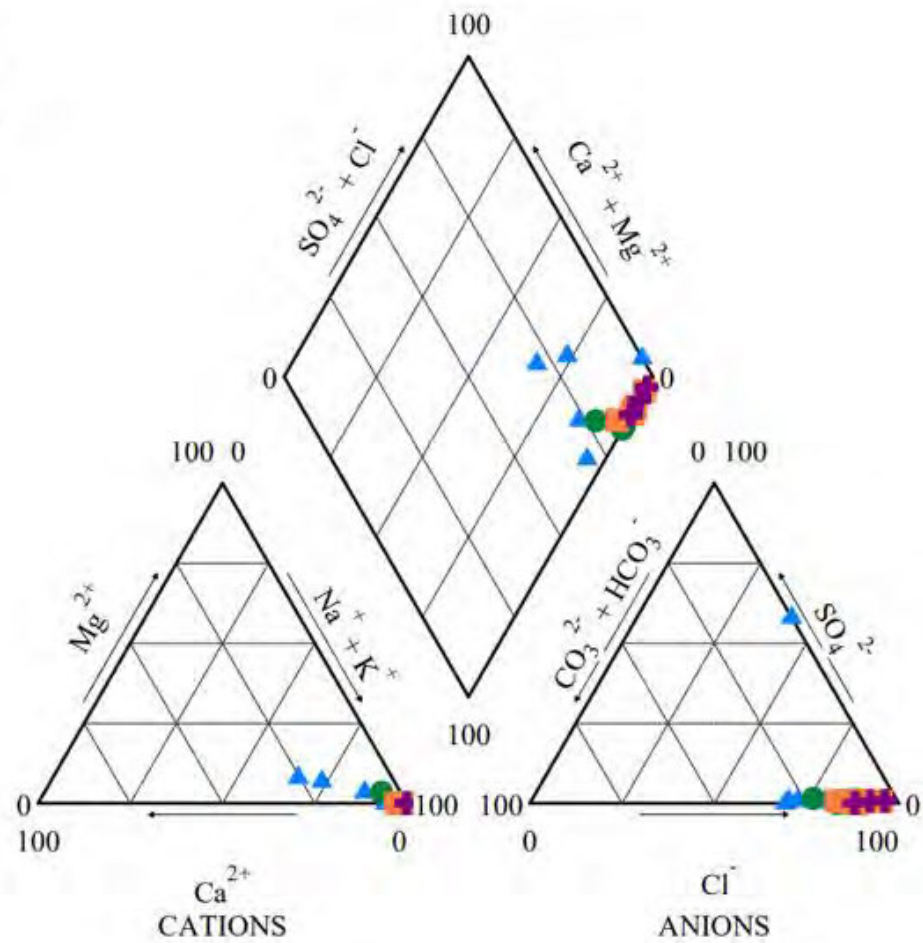
7.2.3 Major Ions Analysis

Major ions analysis was conducted on the tap water samples collected during each monitoring event to categorise the water type. The results of the major ion analysis are visually represented in a Piper Diagram shown in Figure 7-9. Results were comparable to the deep groundwater samples discussed in Section 7.1.4 with a sodium-chloride water type observed. Higher levels of calcium and sulphate were noted in the October 2020 samples.

Figure 7-9 Piper Diagram – Tap water samples

Legend

- ▲ October 2020
- January 2021
- April 2021
- ✚ July 2021



8 Interpretive Analysis

This section discusses the results of the post-winter 2020, post-summer 2021, first quarterly and second quarterly monitoring events conducted in 2021.

Potential trends in concentrations, including Mann-Kendall analysis, and plume migration are discussed in the following sections.

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

- > The **'S' Statistic** indicates whether concentration trend versus time is generally decreasing ($S < 0$) or increasing ($S > 0$).
- > The **Confidence Factor (CF)** value indicates the degree of confidence in the trend result as in "Decreasing" vs. "Probably Decreasing" or "Increasing" vs. "Probably Increasing". A CF between 90% and 95% indicate a "Probably" increasing or decreasing trend, when $CF > 95\%$ the data demonstrate a statistically significant trend, either "Increasing" or "Decreasing".
- > The **Coefficient of Variation (CoV)** is used to distinguish between a 'No Trend' result and a 'Stable' result for dataset with no significant increasing or decreasing trend.

8.1 Groundwater

The spatial extent of PFAS (Sum of PFOS and PFHxS) concentrations in groundwater is shown in (Appendix A):

- > Figures 6A and 6B for the October 2020 event;
- > Figure 7 for the January 2021 event;
- > Figures 8A and 8B for the April 2021 event; and
- > Figure 9 for the July 2021 event.

8.1.1 On-site - Source Areas

At the primary Source Areas on-site, namely the Former Fuel Farm, Fire House and Refuelling Area, Landfills and the Powerhouse, there were localised increases and decreases in PFOA and the sum of PFOS and PFHxS concentrations over time.

PFAS concentrations recorded during the monitoring period were generally the same order of magnitude as historical data. The following exceptions are noted:

- > MW504 (fire house and refuelling area) recorded a new maximum concentration, and new exceedance of the recreation criterion for sum of PFOS and PFHxS in October 2020 ($3.39 \mu\text{g/L}$). The concentration was one order of magnitude greater than the historical data range ($0.04 - 0.49 \mu\text{g/L}$).
- > MW105D (fire house and refuelling area) recorded a new maximum concentration, and new exceedance of the recreation criterion for sum of PFOS and PFHxS in April 2021 ($2.46 \mu\text{g/L}$). The concentration was one order of magnitude greater than the historical data range ($<0.01 - 0.87 \mu\text{g/L}$).
- > MW110S (Landfills) recorded a new maximum concentration, and new exceedance of the drinking water criterion for sum of PFOS and PFHxS in October 2020 ($0.14 \mu\text{g/L}$). The concentration was one order of magnitude greater than the historical data range ($0.01 - 0.05 \mu\text{g/L}$).
- > MW310 (powerhouse) recorded a new minimum concentration for PFOA in October 2020 ($0.05 \mu\text{g/L}$). The concentration was one order of magnitude lower than the historical data range ($0.25 - 2.27 \mu\text{g/L}$). MW310 also reported new minimum concentrations for sum of PFOS and PFHxS in October 2020 ($5.98 \mu\text{g/L}$) and April 2021 ($3.98 \mu\text{g/L}$). The concentrations were one order of magnitude lower than the historical data range ($14.4 - 78.1 \mu\text{g/L}$).

Plume stability (using Mann-Kendall analysis) has been calculated for each well that has sufficient temporal data [i.e. a minimum of four (4) results]. Groundwater monitoring data recorded between February 2018 and July 2021 was used for the assessment, with outputs of the Mann-Kendall analysis presented in Appendix D.

Statistical trend analysis outcomes for PFOA and the sum of PFOS and PFHxS are summarised in Table 8-1.

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

Source Area	Location	PFOA Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Trend	Confidence Factor (%)
Former Fuel Farm	MW101I	No Trend	50.0	Stable	88.3
	MW102D	No Trend	88.3	Increasing	95.8
	MW112S	Stable	39.3	No Trend	89.8
	MW113S	Stable	39.3	Stable	81.5
	MW301 ⁽¹⁾	Probably Increasing	93.2	Decreasing	99.2
	MW302 ⁽¹⁾	Stable	50.0	Stable	75.8
	MW303	Stable	72.6	Stable	64.0
Fire House and Refuelling Area	MW104I	No Trend	64.0	No Trend	64.0
	MW105D	No Trend	81.5	No Trend	86.4
	MW304	No Trend	89.0	Stable	88.3
	MW305	Stable	66.7	No Trend	62.5
	MW306	Increasing	98.4	Stable	37.5
Powerhouse	MW307	Decreasing	96.9	Stable	75.8
	MW308	No Trend	61.4	Stable	62.5
	MW309	No Trend	61.4	Decreasing	95.8
	MW310	Stable	81.0	Probably Decreasing	93.2
Landfills	MW106S	Stable	39.3	Stable	39.3
	MW109S	Probably Decreasing	93.2	No Trend	86.4
	MW110S	Stable	39.3	Increasing	97.2

Note: (1) February 2019 outlier values not included in the Mann-Kendall test

The results of the trend analysis, supported by the Mann-Kendall test indicate:

- > At the former fuel farm, MW102D located down-gradient displays an increasing trend of sum of PFOS and PFHxS. However, adjacent well MW101I has recorded decreasing concentration values (by less than one order of magnitude) since the start of the OMP. MW301 up-gradient of the source area, displays a decreasing trend of sum of PFOS and PFHxS and a probably increasing trend of PFOA.
- > The fire house and refuelling area monitoring network display stable trends, with the exception of an increasing PFOA trend at MW306, suggesting no significant change in the plume extent at this source area.
- > At the Powerhouse, MW309 reported a decreasing trend of PFOS and PFHxS and MW310 reported a probably decreasing sum of PFOS and PFHxS concentration trend with 93.2% confidence. A decreasing trend in concentrations values has been observed at this well since December 2019. MW308 recorded a new concentration minimum for PFOS and PFHxS in October 2020. MW307 displays a decreasing PFOA trend. These decreasing trends could suggest that the impacted groundwater plume beneath the powerhouse source area is shrinking.
- > At the landfills, MW110S displayed an increasing sum of PFOS and PFHxS concentration with 97.2% confidence. MW109S, reported a probably decreasing PFOA trend with 93.2% confidence and sum of PFOS and PFHxS concentrations at this well have decreased by one order of magnitude since monitoring started.

Overall, the groundwater monitoring results do not suggest a change in the understanding of contamination or risk at the source areas. However, indicators of a plume depletion are noted at the former fuel farm and

powerhouse source areas. It is noted that MW107S and MW108S (landfills) have consistently been found dry during the monitoring period and therefore no data was collected at these locations.

8.1.2 On-site - Secondary Sources

The PFAS concentrations are predominantly consistent across the secondary sources monitoring network, with exception of a significant increase in Sum of PFHxS and PFOS at MW312 from 1.23 µg/L in October 2020 to 3.25 µg/L in April 2021, exceeding the recreational water criterion. It is noted that this was not a new maximum.

The sum of PFOS and PFHxS concentrations have continually been recorded across the network above the HEPA (2020) PFAS NEMP Human Health Drinking Water guideline, with the exception of MW401 (abstraction bore), that has consistently recorded concentrations below the laboratory LOR. The relative stability in the concentrations across the network suggests the plume geometry is not significantly changing. However, it is also noted that a number of wells in this network have been reported occasionally or consistently dry (MW111S and MW114S).

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

Table 8-2 Mann-Kendall Trend Analysis Summary – On-site Secondary Source Area

Source Area	Location	PFOA Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Trend	Confidence Factor (%)
Site Drainage	MW115S	Stable	39.3	Probably Decreasing	93.2
Water Supply Infrastructure	MW312	No Trend	64.0	No Trend	50.0
	MW313	Probably Decreasing	94.6	Stable	76.5
Abstraction Bore 1	MW401	Stable	45.6	Stable	45.6
Abstraction Bore 2	MW402	Stable	54.8	Stable	72.6

The results of the Mann-Kendall trend analysis indicate that the PFAS plume generally displays a stable or no statistically significant trend. A probably decreasing trend was reported for PFOA at MW313. A probably decreasing trend for sum of PFOS and PFHxS is observed at MW115S located within the site drainage. These observations don't change the current understanding of the risk at these locations.

8.1.3 On-site – Other

Concentrations of PFOA have remained below the laboratory LOR, with all concentrations below the HEPA (2020) PFAS NEMP Human Health Drinking Water and Recreational Water guidelines.

The concentrations for the sum of PFOS and PFHxS reported above the laboratory LOR were generally below the assessment criteria, with exception of MW116S, MW123I and MW138S exceeding the Human Health Drinking Water guideline.

Monitoring wells MW123I and MW138S are considered downgradient of the on-site source areas and provide indications on the migration of PFAS off-site, with MW138S in particular located adjacent to the southern boundary and recording the highest sum of PFOS and PFHxS concentrations of the boundary monitoring wells. In addition, a detection of PFAS concentrations in MW133D could indicate off-site and/or deeper migration of the PFAS plume. Further monitoring at this location will confirm if vertical migration is occurring.

Plume stability (Mann-Kendall analysis) has been calculated for each well that has sufficient temporal data. Groundwater monitoring data recorded between February 2018 and August 2021 was used for the assessment, with outputs presented in Appendix D. Groundwater monitoring well trends for PFOA and the sum of PFOS and PFHxS are summarised in Table 8-3.

Table 8-3 Mann-Kendall Trend Analysis – On-site Other Areas

Source Area	Location	PFOA Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Trend	Confidence Factor (%)
Airside Perimeter	MW116S	Stable	39.3	Probably decreasing	93.2
	MW117I	Stable	40.8	No Trend	50.0
	MW118D	Stable	39.3	Stable	39.3
	MW119S	Stable	40.8	Stable	82.1
	MW120I	Stable	39.3	Stable	76.5
	MW121D	Stable	39.3	Stable	86.4
	MW122S	Stable	39.3	Stable	86.4
	MW123I	Stable	39.3	Stable	81.5
	MW124D	Stable	40.8	Stable	40.8
Boundary	MW125S	Stable	39.3	Stable	39.3
	MW126I	Stable	39.3	Stable	39.3
	MW128D	Stable	39.3	Stable	39.3
	MW129S	Stable	39.3	Stable	39.3
	MW130D	Stable	40.8	Stable	40.8
	MW131S	Stable	39.3	Stable	39.3
	MW132I	Stable	39.3	No trend	81.5
	MW133D	Stable	40.8	No Trend	88.3
	MW134D	Stable	39.3	Stable	37.5
	MW135I	Stable	39.3	Stable	39.3
	MW136D	Stable	39.3	Stable	39.3
	MW138S	Stable	40.8	Stable	59.2
	MW139I	Stable	40.8	Stable	40.8
	MW140D	Stable	40.8	Stable	40.8

The results of the Mann-Kendall trend analysis indicate that the plume displays a stable or no statistically significant trend. MW137S (background well) recorded a first time detect of sum of PFOS and PFHxS concentrations in October 2020, however concentrations were below LOR in April 2021. It is not considered that this well located up-gradient is impacted by the site.

Overall, the groundwater monitoring results do not suggest a change in the understanding of contamination or risk at these locations.

8.1.4 Off-site

Four off-site monitoring wells, MW141S, MW142S, MW143S and MW403 have been sampled since March 2019. MW143S was reported dry for all monitoring events between September 2020 and August 2021.

PFOA concentrations during these events have all been reported below the adopted assessment criteria.

MW142S and MW403 reported sum of PFOS and PFHxS concentrations below the LOR for all monitoring events between September 2020 and August 2021. MW141S recorded sum of PFOS and PFHxS concentrations above the HEPA (2020) PFAS NEMP Human Health Drinking Water guideline in all four monitoring events. The concentrations order of magnitude was similar to historical results. The concentrations reported at MW141S are likely linked to an off-site migration pathway, similar to the detects in MW138S.

All PFOA and the sum of PFOS and PFHxS concentrations within MW403 and the production bores P140 and P145 were consistently reported below the laboratory LOR indicating that the risk to the receptor (Water Corporation production bores) remains low and acceptable.

Plume stability (Mann-Kendall analysis) has been calculated for each well that has sufficient temporal data. Groundwater monitoring data recorded between February 2018 and August 2021 was used for the assessment, with outputs presented in Appendix D. Groundwater monitoring well trends for PFOA and the sum of PFOS and PFHxS are summarised in Table 8-4.

Table 8-4 Mann-Kendall Trend Analysis – Off-site

Source Area	Location	PFOA Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Trend	Confidence Factor (%)
Off-site	MW141S	No Trend	84.6	No Trend	87.0
	MW142S	Stable	46.0	Stable	45.2
	MW403	Stable	46.0	Stable	46.0
Background	MW137S	Stable	40.8	No Trend	59.2

The results of the Mann-Kendall trend analysis indicate that the plume displays a stable or no statistically significant trend. Potential increasing concentrations are observed at MW141S based on the Sum of PFOS and PFHxS results from September 2020 onwards, however, no new maximums have been reported since August 2020. Ongoing monitoring will be required to confirm the concentration trend at this well or if seasonal variability is occurring.

Overall, the groundwater monitoring results do not suggest a change in the understanding of contamination or risk at these locations.

8.2 Tap Water

The spatial extent of PFAS (Sum of PFOS and PFHxS) concentrations in tap water is shown in (Appendix A):

- > Figures 6A and 6B for the October 2020 event;
- > Figure 7 for the January 2021 event;
- > Figures 8A and 8B for the April 2021 event; and
- > Figure 9 for the July 2021 event.

New concentration maximums for PFOA were reported in July 2021 at all tap water sampling locations with exception of POT101. All concentrations were within the same order of magnitude as the LOR and there were no exceedances of the drinking water or recreational water criteria.

All tap water locations reported new maximum concentrations for the sum of PFOS and PFHxS in July 2021. The samples have generally been recorded one to two orders of magnitude above the HEPA (2020) PFAS NEMP Human Health Drinking Water guideline. There were no exceedances of recreational criterion.

Mann-Kendall trend analysis has been calculated for each location that has sufficient temporal data. Tap water monitoring data recorded between February 2018 and August 2021 was used for the assessment, with outputs presented in Appendix D. Trends in tap water for PFOA and the sum of PFOS and PFHxS are summarised in Table 8-5.

Table 8-5 Mann-Kendall Trend Analysis – Tap Water

Source Area	Location	PFOA Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Trend	Confidence Factor (%)
Leach Field Hut (Outdoor)	POT101	Stable	50.0	No Trend	70.0
Air Traffic Control Tower (Outdoor)	POT102	No Trend	81.0	Probably Increasing	93.4
Crew Huts Kitchenette (Indoor)	POT103	Stable	50	Stable	53.5
Fire House Kitchenette (Indoor)	POT104	Probably Increasing	92.2	Probably Increasing	94.6

Source Area	Location	PFOA Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Trend	Confidence Factor (%)
Former Pearce Flying Club (Outdoor)	POT105	No Trend	66.8	No Trend	70.0

The results of the Mann-Kendall trend analysis indicate that the concentrations generally display a stable or no statistically significant trend. A probably increasing trend was reported at the Air traffic control tower for sum of PFOS and PFHxS and at the fire house kitchenette for both PFOA and sum of PFOS and PFHxS.

These locations are not used for potable water (with “not for drinking water use” signage) and it is noted that a number of these buildings are in the process of being demolished. As a result, there is no change in the understanding of the contamination or risk at these sampling locations.

9 Conceptual Site Model

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

The understanding of on-site sources and secondary on-site source areas presented in the investigation phase (Jacobs, 2018c) is supported by the OMP monitoring data presented in this report. The predominant stability in PFAS trends in groundwater at the other on-site wells and off-site wells also suggests the risk profile of these locations do not appear to be changing significantly.

The pathways for PFAS exposure and risks to human health and ecological receptors presented in the investigation phase (Jacobs, 2018c) are considered to be relevant and data presented in this report does not suggest any significant changes to these mechanisms or risks.

The data presented in this report does not trigger the need to update the current conceptual site model (CSM). Future monitoring will continue to contribute to an evaluation any potential changes to the CSM understanding.

10 Discussion

10.1 Risk Profile

Findings of the first year of OMP implementation at the site are presented in the 2020 AIR (Cardno, April 2021) supported the outcomes of the Tier 2 Human Health Risk Assessment (HHRA) - Offsite Receptors (Jacobs, 2018d) and Tier 3 Human Health Risk Assessment - Onsite Receptors (Jacobs, 2018e).

These risk assessments indicated that *“while the potential for PFAS impacts to the Gnangara UWPCA cannot be ruled out, it was considered that the risk to the current identified off-site receptors - the Pinjar Production Bores – has not occurred and future risk of this occurring is acceptably low. This determination was based on consideration of the following:*

- > *PFAS had not been detected by WA Water Corporation at the Pinjar P140 and P145 abstraction bores;*
- > *PFAS had not detected in monitoring well GC19 (MW403) located half way between the boundary of the site and the two abstraction bores. The location of this well is such that it can be used to provide a reliable early indication as to whether PFAS might be detected in the Pinjar abstraction bores at some point in the future [i.e. it is highly unlikely that PFAS would be detected in the Pinjar abstraction bores without first being detected in MW403 (GC19)]; and*
- > *A highly conservative analysis of PFOS + PFHxS dispersion away from the identified source areas has been performed. The results indicate that the time period before which PFOS + PFHxS (or other PFAS compounds) would theoretically be detected at concentrations in exceedance of the drinking water criteria at the GC19 sentinel monitoring well location would be substantial - ranging from 50 years to 150 years.”*

In addition, it was determined that *“the risks to typical base personnel at the site from chronic exposure to non-potable water impacted with PFAS was low and acceptable. This was on the basis that whilst tap water at the site did contain levels of PFAS and the water is used for various non-drinking purposes, incidental exposure from the PFAS is low and acceptable and thus the potential consequences to health are insignificant”*.

The current available data, including one additional year of ongoing monitoring, indicates that no significant change to this risk profile can be established based on the following:

- > The groundwater characteristics and flow direction have been consistent since the start of the investigations;
- > Plume stability, evaluated through Mann-Kendall analysis, does not indicate evidence of plume migration or significant increase in concentrations that would warrant a revision of the risk assessment;
- > MW403, monitored quarterly, hasn't recorded a PFAS detection to date; and
- > Groundwater abstracted onsite is not used for potable water (with “not for drinking water use” signage at each tap outlet) and it is noted that a number of buildings are in the process of being demolished which will reduce the number of taps onsite.

However, it is noted that sum of PFOS and PFHxS concentrations are detected at some south and southwest boundary monitoring wells, downgradient of the on-site source areas, along with off-site monitoring well MW141S. This potentially indicates the presence of an off-site migration pathway (i.e. plume movement) with groundwater flow to the south west. There were no significant increases in concentrations observed this monitoring period, however, ongoing monitoring at these locations is recommended.

The data evaluated in this report does not indicate changes to the nature and extent of PFAS in groundwater which would lead to an increasing or decreasing risk. The risk profile for the Management Area remain low and acceptable.

10.2 Triggers for OMP Review

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

- > Policy changes, regulatory requirements or regulator advices;
- > Feedback and information received as part of stakeholder engagement activities;
- > A change in the understanding of the risk for the site;

- > Significant changes of land use within the Management Area or at close proximity;
- > Impacts of remediations works; and
- > The requirements of a post-remediation Site Management Plan.

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

11 Conclusions

Groundwater and tap water monitoring were completed at the site between September 2020 and August 2021 in general accordance with the SAQP (Cardno, 2021). The monitoring conducted during September 2020 – August 2021 is considered to have met the OMP objectives outlined in Section 1.2.

Groundwater Network

The concentrations of PFAS in the groundwater recorded during the September 2020 – August 2021 monitoring period generally displayed similar concentrations to historical monitoring results. A number of wells reported some new maximums in concentration of PFOA or sum of PFOS and PFHxS to a first-time exceedance of the relevant assessment criteria. New exceedances of the drinking water criteria were reported at the former fuel farm (MW302 for PFOA) and landfills (MW110S for sum of PFOS and PFHxS). New exceedances of the recreational use criteria were reported at the firehouse and refuelling area (MW504 and MW105D for sum of PFOS and PFHxS).

Sum of PFOS and PFHxS concentrations consistently reported above the HEPA (2020) drinking water criterion at boundary monitoring well MW138S downgradient of the on-site source areas, and off-site monitoring well MW141S indicates a possible off-site migration pathway to the south-west. Concentrations have not shown a statistically significant increase this monitoring period, however ongoing monitoring at these locations should be continued to provide more confidence in the concentration trends. The risk to off-site receptor (Water Corporation production bores and Gngangara aquifer) remains low and acceptable as PFAS concentrations in MW403 located further downgradient were consistently below the LOR.

Tap Water Network

PFAS concentrations across the tap water network on-site generally display a stable or no statistically significant trend. A probably increasing trend was reported at the Air traffic control tower tap for sum of PFOS and PFHxS and at the fire house kitchenette tap for both PFOA and sum of PFOS and PFHxS. These locations are not used for potable water (with “not for drinking water use” signage) and it is noted that a number of these buildings are in the process of being demolished. As a result, there is no change in the understanding of the contamination or risk at these sampling locations. Onsite Abstraction bores, understood to be connected to the site’s water tanks and tap network, will continue to be monitored for PFAS as part of the PFAS OMP.

CSM and risk profile

The current available data doesn’t identify the need for a CSM update. The September 2020 – August 2021 monitoring results did not identify a change in the risk profile for the Monitoring Area (including the Management Area) that would trigger the need for an OMP review or further management actions.

12 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
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14. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
15. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

Site Specific References

1. Cardno, April 2020, PFAS OMP, Biannual Monitoring Factual Report – post-winter 2019.
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7. Cardno, April 2021, PFAS OMP – 2020 Annual Interpretive Report.
8. Cardno, August 2021, PFAS OMP Biannual Monitoring Factual Report – post-summer 2021.
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10. Cardno, August 2021, PFAS OMP Sampling and Analysis Quality Plan (SAQP) Rev5.
11. Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.
12. Department of Defence, 2018b, Gingin Satellite Airfield PFAS Investigation, PFAS Management Area Plan.
13. Jacobs, 2018a, Preliminary Conceptual Site Model - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0001).

14. Jacobs, 2018b, Sampling, Analysis and Quality Plan - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0002).
15. Jacobs, 2018c, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-003).
16. Jacobs, 2018d, Tier 2 Human Health Risk Assessment – Offsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0005).
17. Jacobs, 2018e, Tier 3 Human Health Risk Assessment – Onsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0006).
18. Jacobs, 2019, PFAS Ongoing Groundwater Monitoring Report (No. IS219200-0000-NP-RPT-0008).

APPENDIX

A

FIGURES



now





Legend

Site Boundary / Management Area

Monitoring Area

FIGURE 1
1:60,000 Scale at A3

Meters

0 1,000 2,000

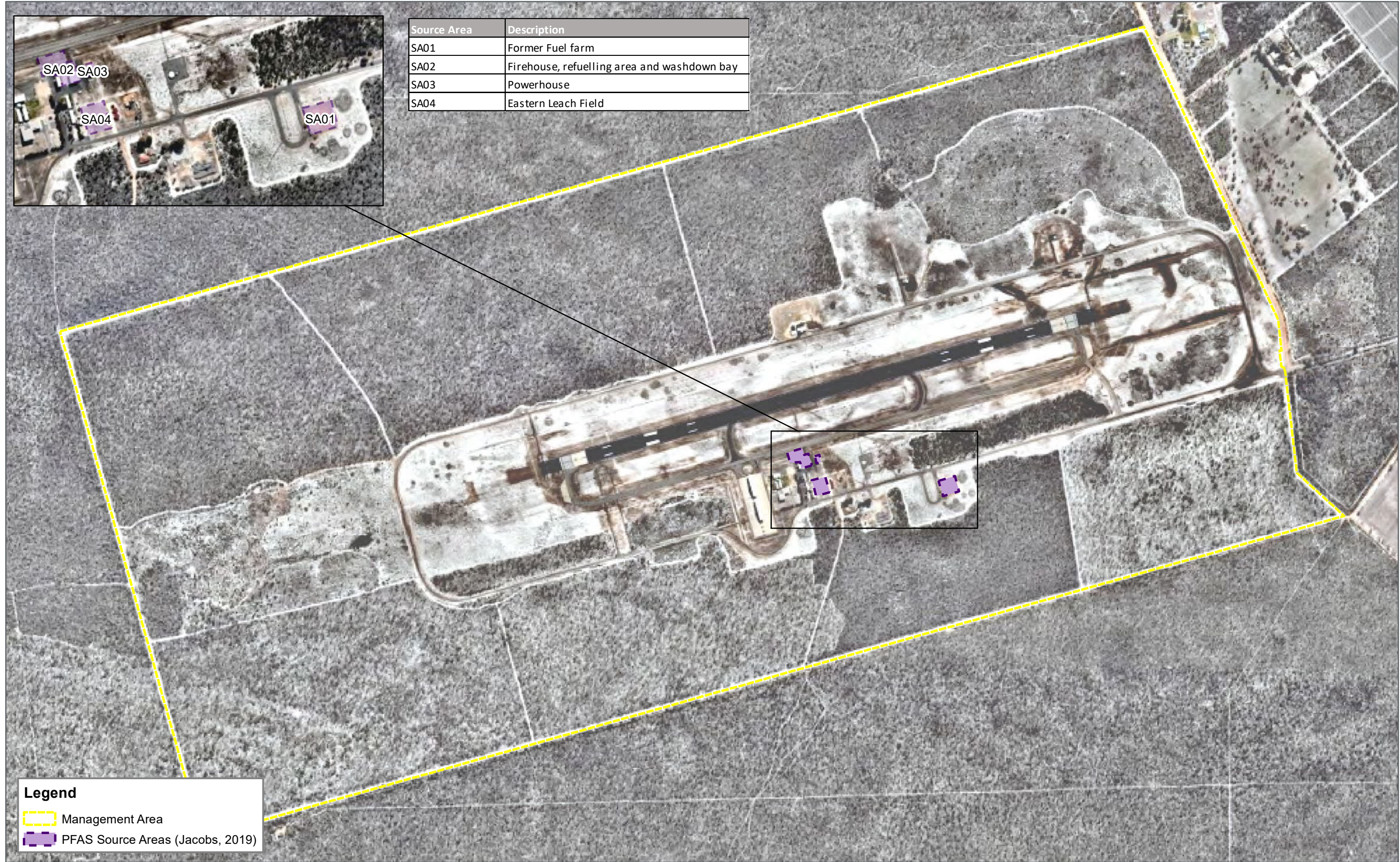
Site Location

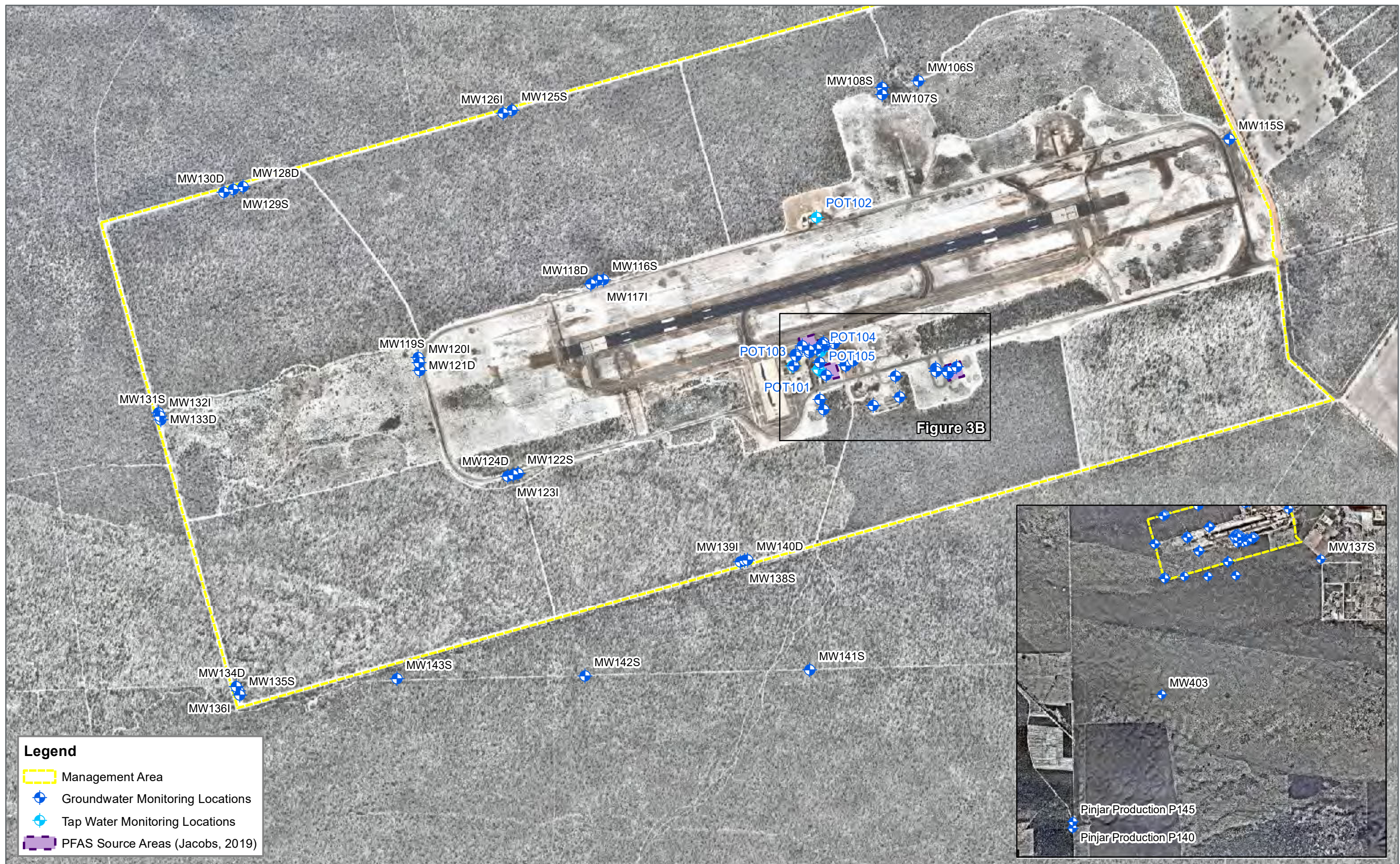
ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
 Date: 2022-01-18 | Project: DEF19009
 Coordinate System: GDA 1994 MGA Zone 50
 Map: DEF19009_WA_0958-GS-001_RegionalLocation 03.mxd
 Aerial Imagery Supplied by Nearmap (Dec 2019)

Source Area	Description
SA01	Former Fuel farm
SA02	Firehouse, refuelling area and washdown bay
SA03	Powerhouse
SA04	Eastern Leach Field



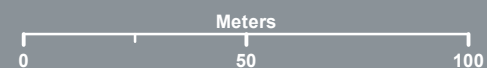




Legend

- Groundwater Monitoring Locations
- Tap Water Monitoring Locations
- PFAS Source Areas (Jacobs, 2019)

FIGURE 3B
1:1,700 Scale at A3



Monitoring Locations

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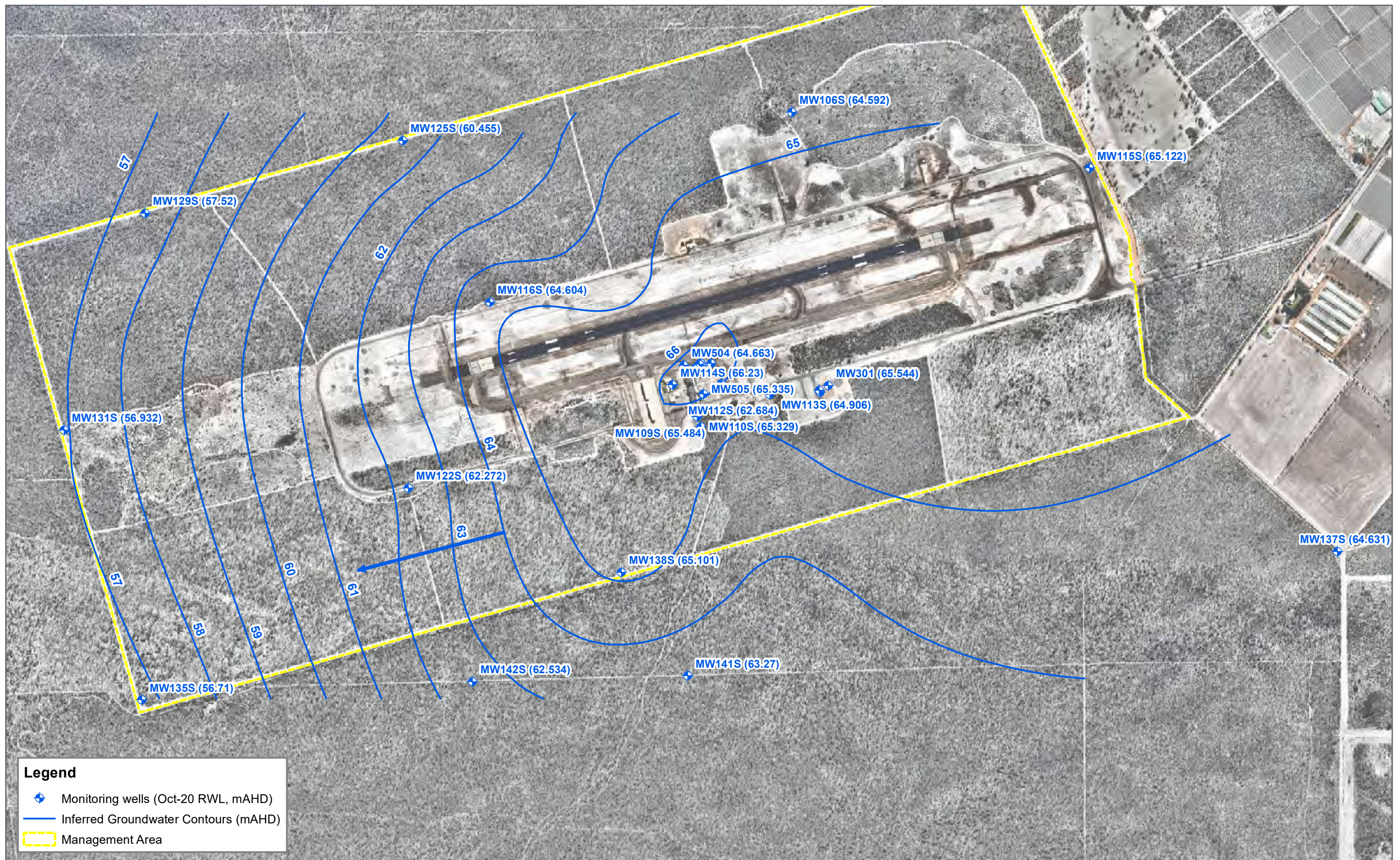


FIGURE 4A
1:13,000 Scale at A3

Meters
0 200 400

October 2020 Groundwater Contours (Shallow Aquifer)

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GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



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Coordinate System: GDA 1994 MGA Zone 50
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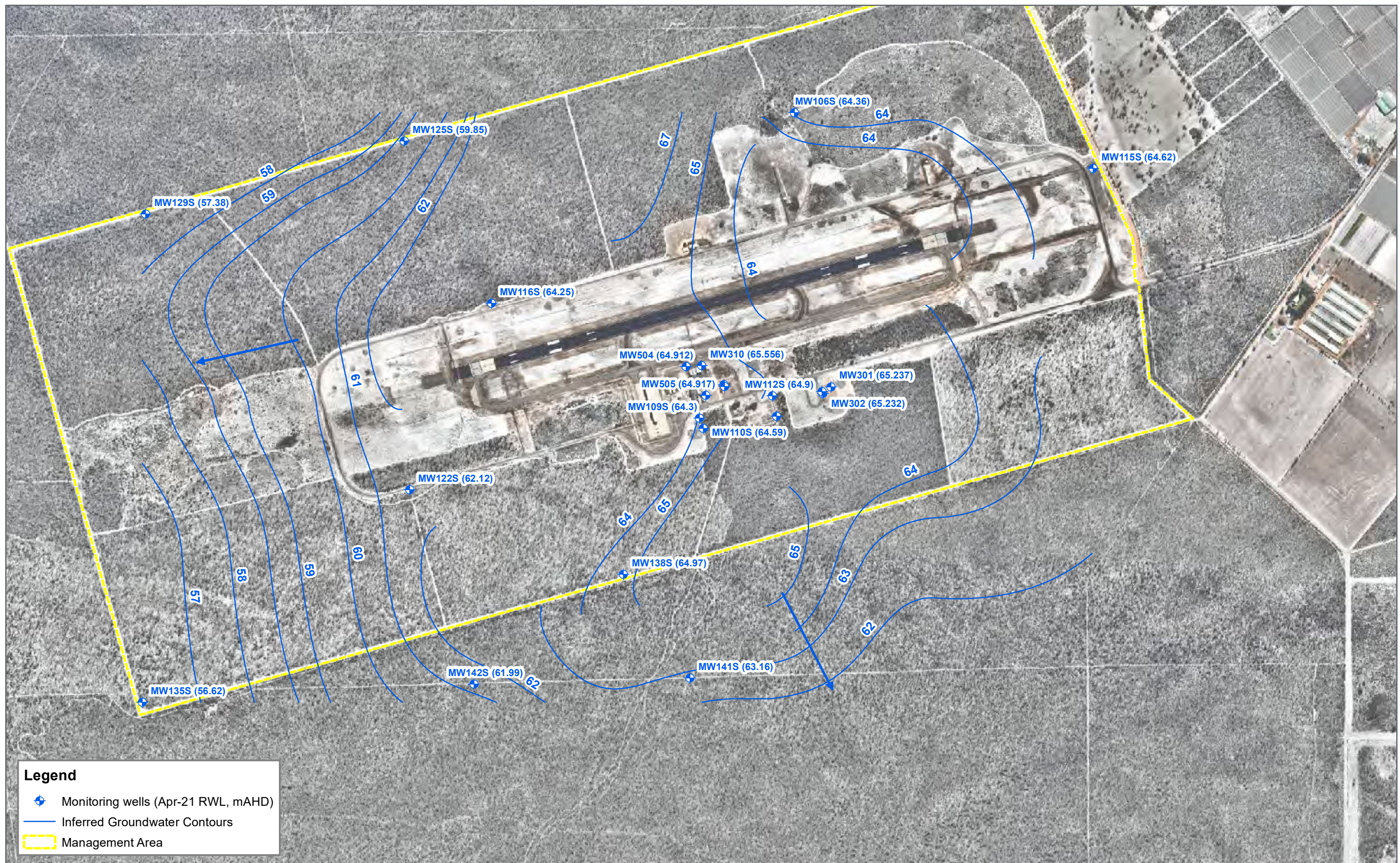


FIGURE 4B
1:13,000 Scale at A3

Meters
0 200 400

April 2021 Groundwater Contours (Shallow Aquifer)

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



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Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-004B_Apr-21ShallowGroundwaterContours 01.mxd
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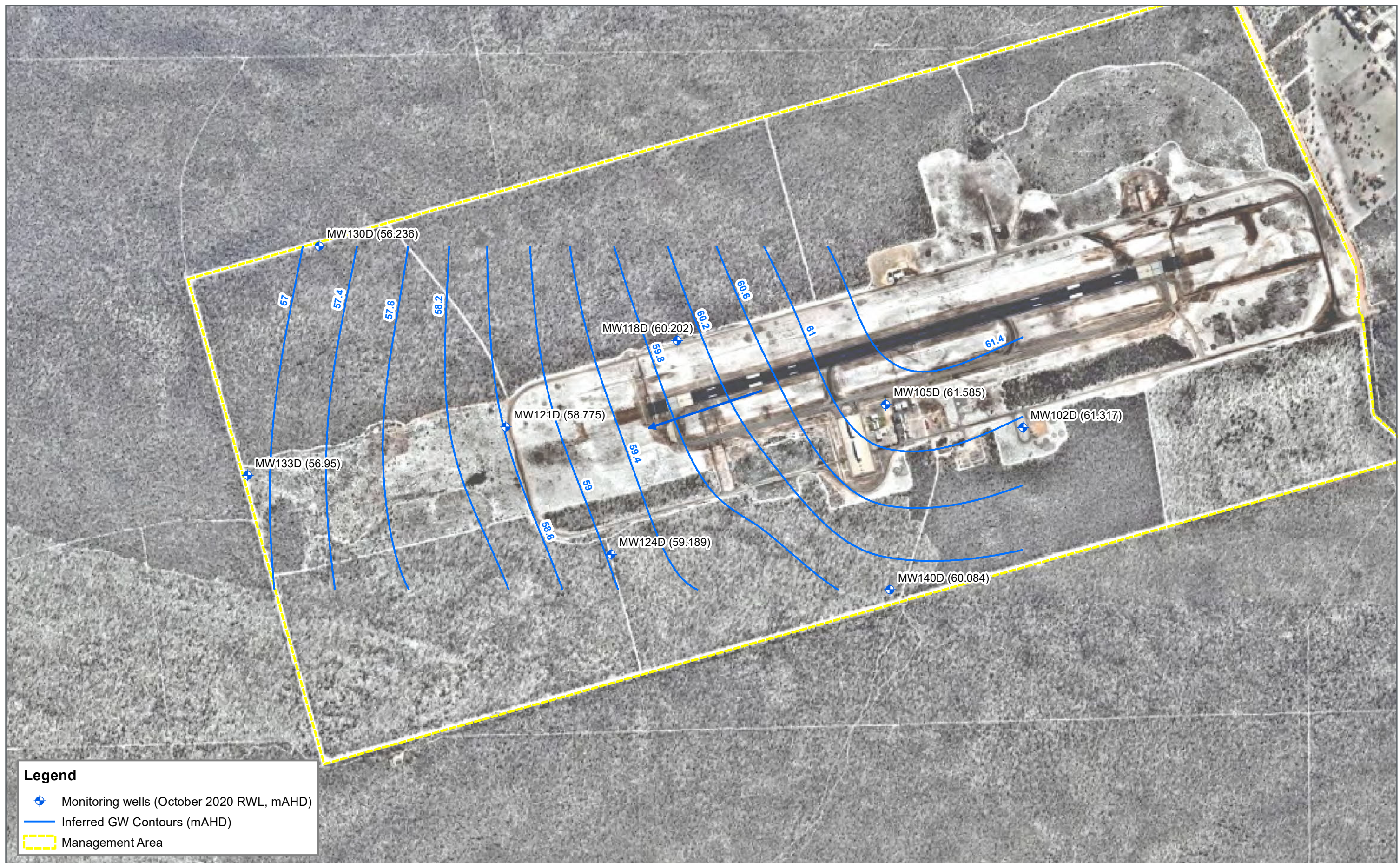


FIGURE 5A
1:12,500 Scale at A3

Meters
0 200 400

October 2020 Groundwater Contours (Deep Aquifer)

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
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Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-005B_Oct20DeepGroundwaterContours 01.mxd
Aerial Imagery Supplied by Nearmap



FIGURE 5B
1:13,000 Scale at A3

Meters
0 200 400

April 2021 Groundwater Contours (Deep Aquifer)

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Cardno

Map Produced by Cardno WA
Date: 2022-01-18 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-005_Apr-21DeepGroundwaterContours 01.mxd
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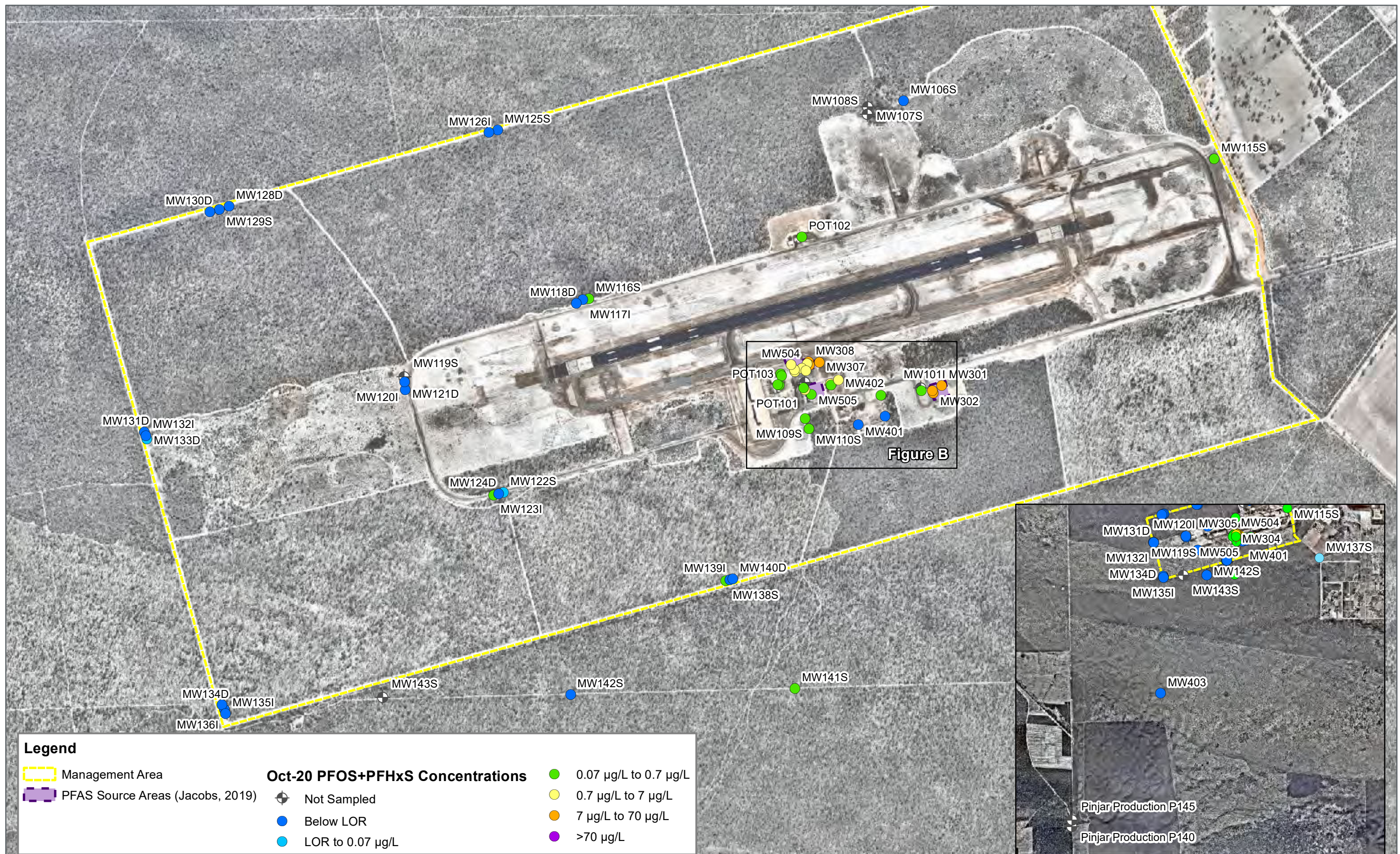


FIGURE 6A
1:12,500 Scale at A3

Meters
0 200 400

PFOS+PFHxS Concentrations in Groundwater - October 2020

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



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Coordinate System: GDA 1994 MGA Zone 50
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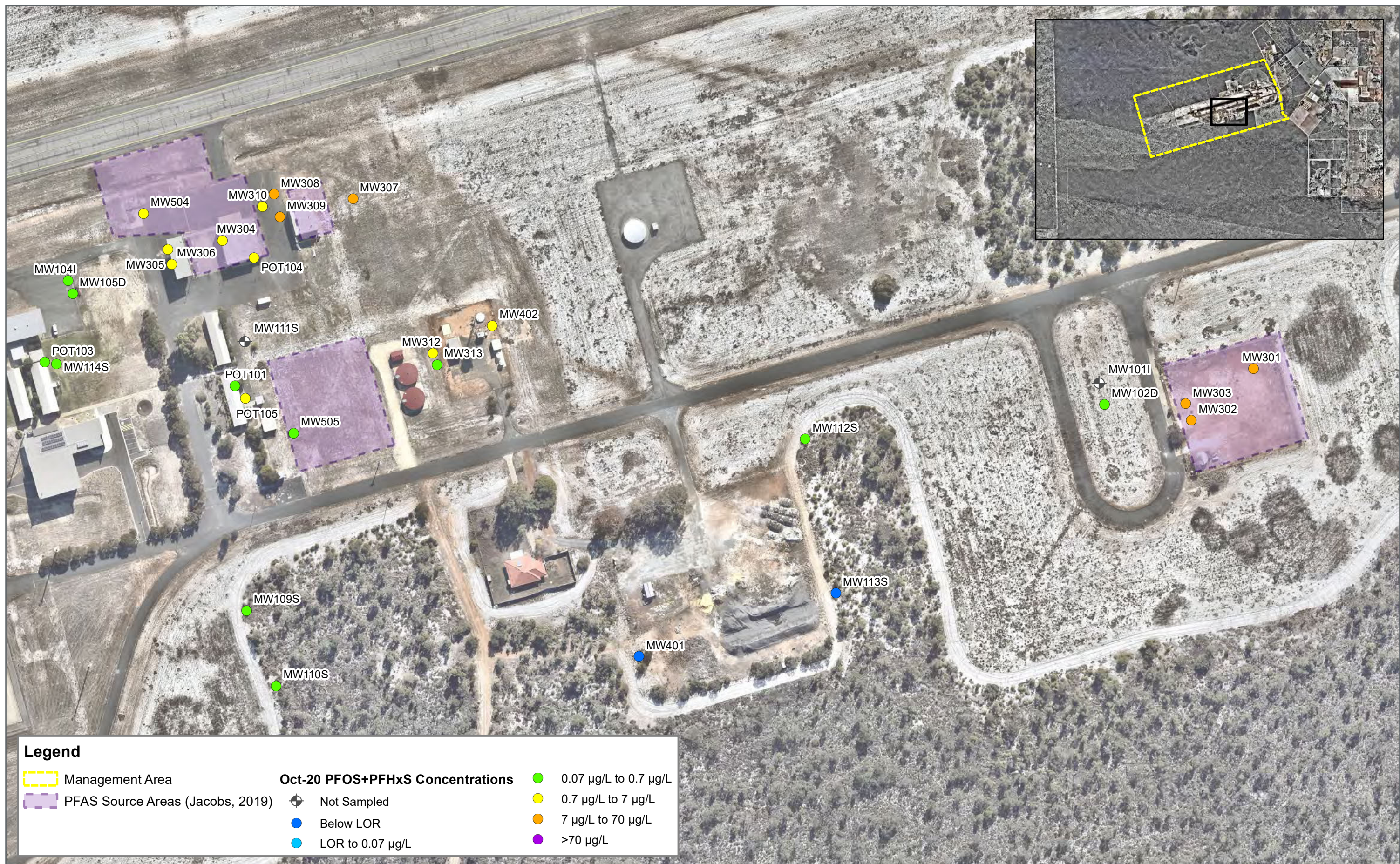
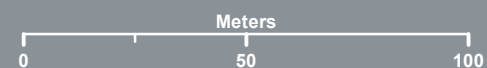


FIGURE 6B
1:1,700 Scale at A3



PFOS+PFHxS Concentrations in Groundwater - October 2020

ANNUAL INTERPRETIVE REPORT
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DEPARTMENT OF DEFENCE



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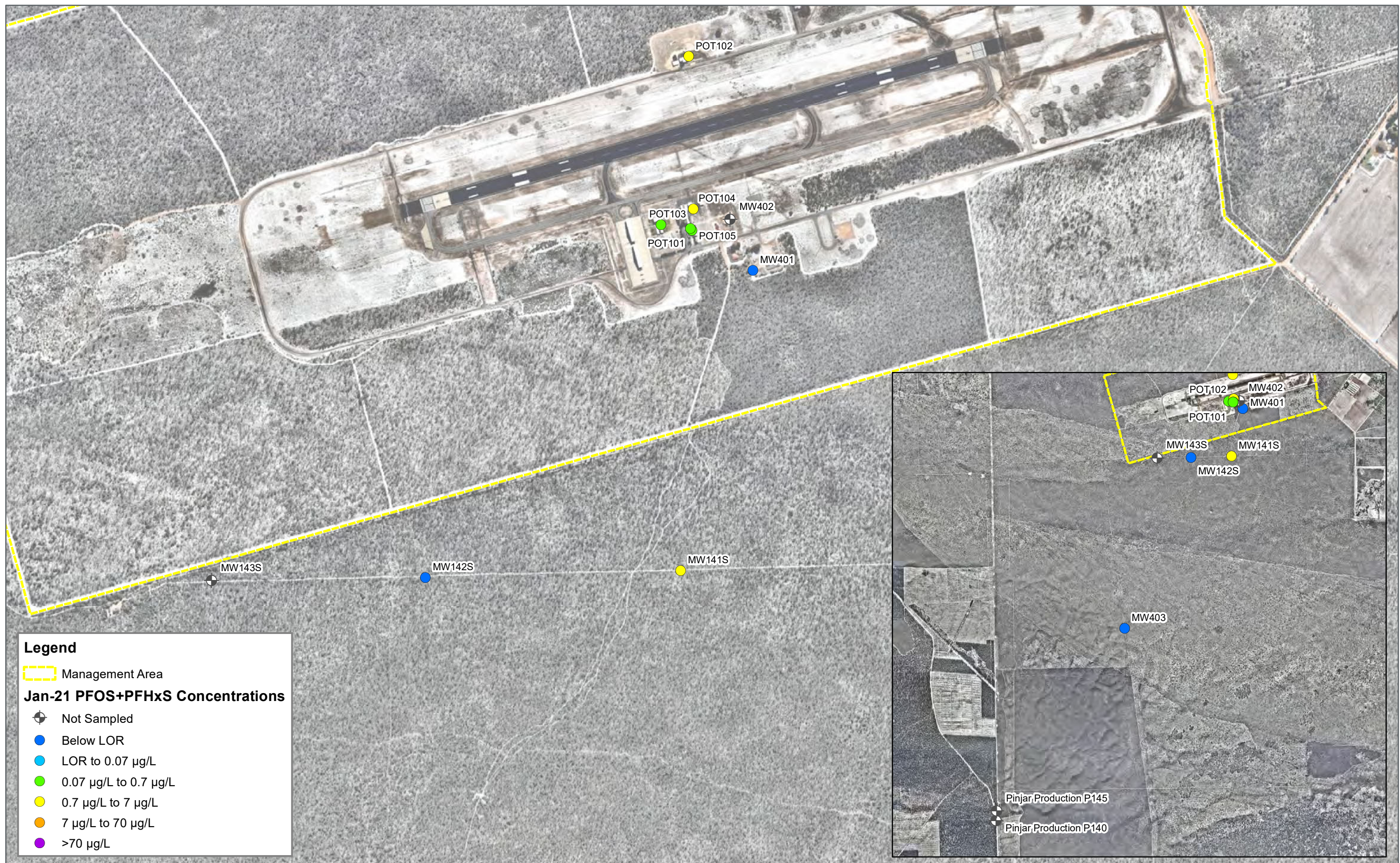


FIGURE 7
1:11,000 Scale at A3

Meters
0 200 400

**PFOS+PFHxS Concentrations
in Groundwater - January 2021**

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE

Cardno

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Coordinate System: GDA 1994 MGA Zone 50
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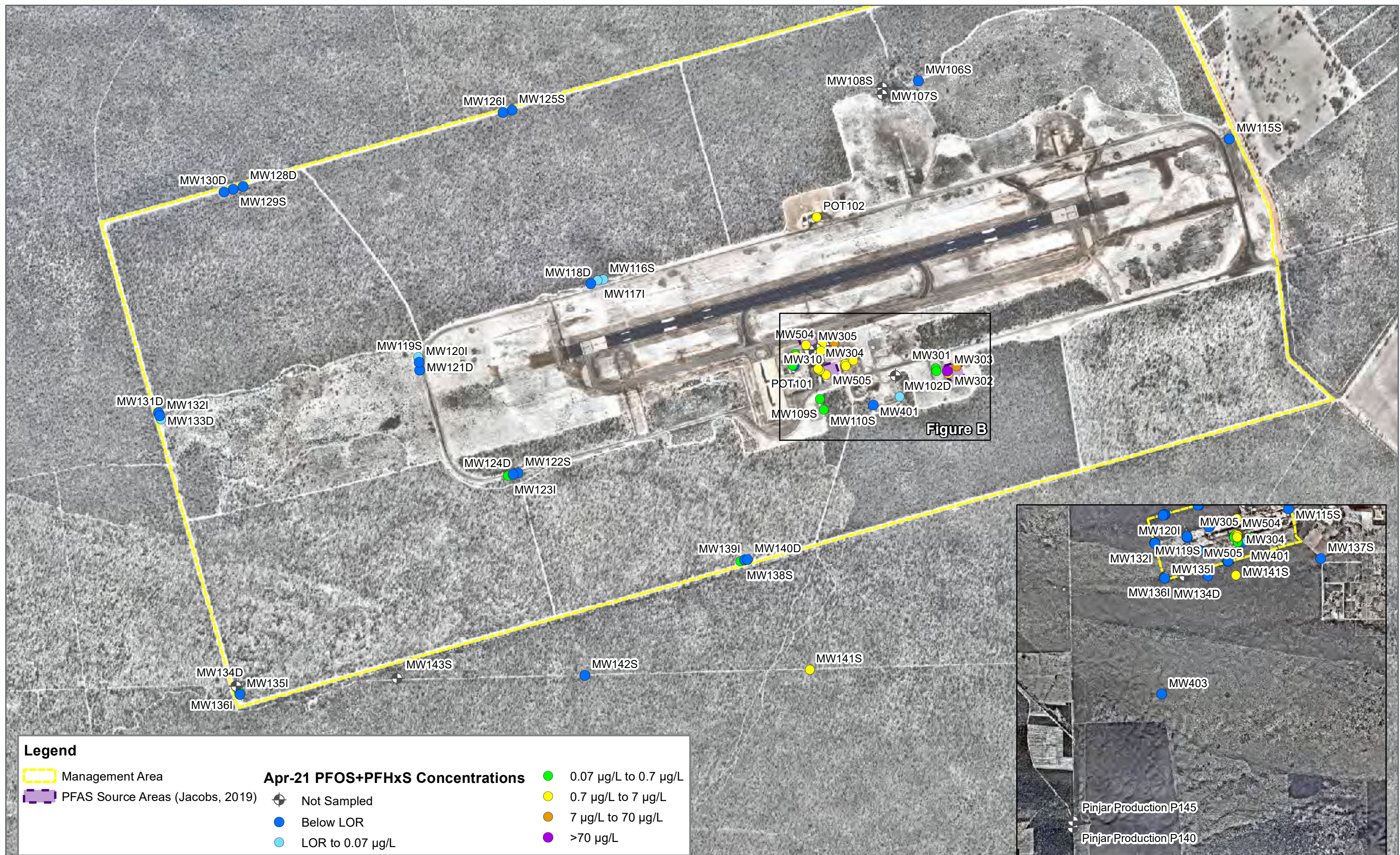


FIGURE 8A
1:12,500 Scale at A3

Meters
0 200 400

**PFOS+PFHxS Concentrations
in Groundwater - April 2021**

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE

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Coordinate System: GDA 1994 MGA Zone 50
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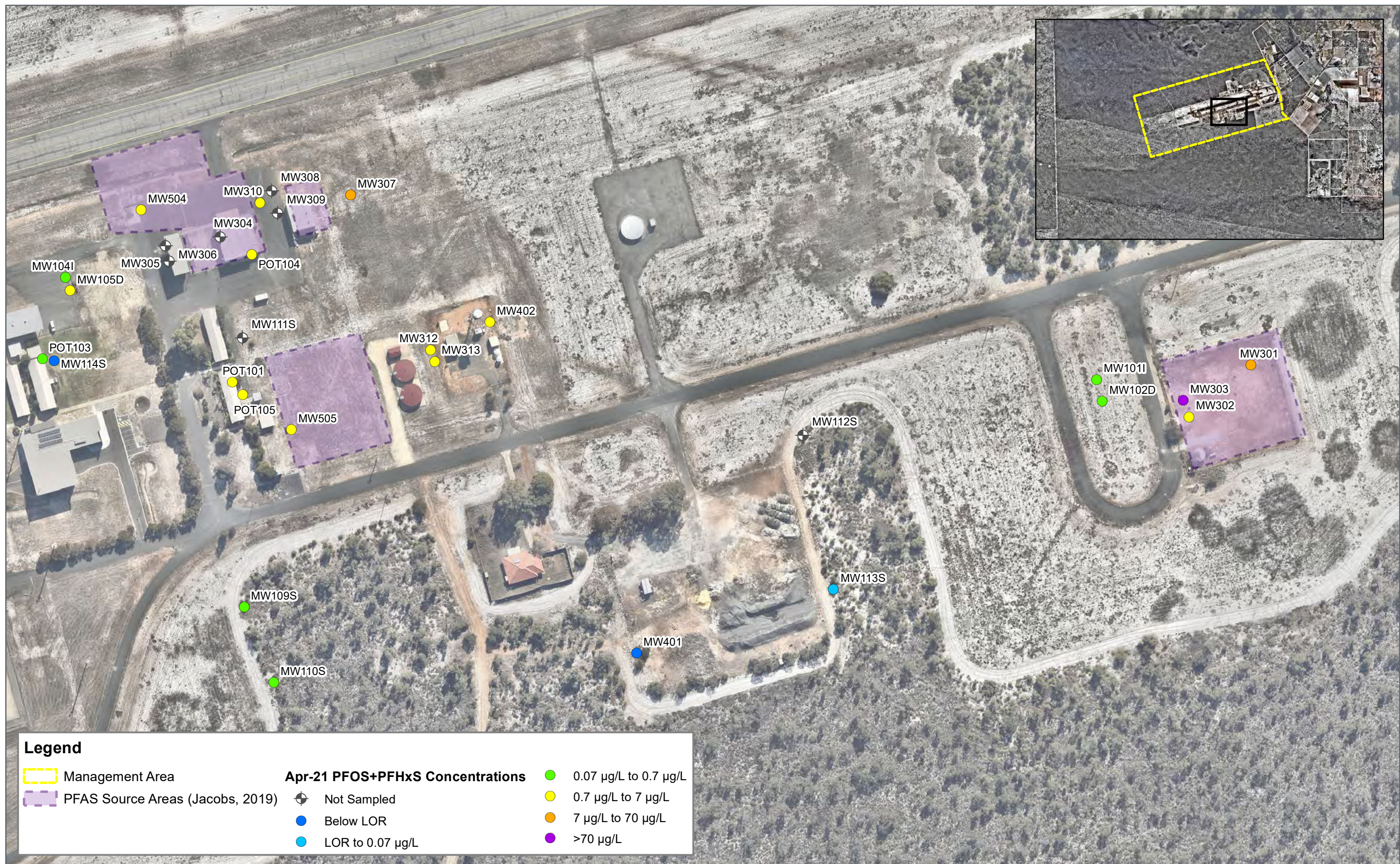
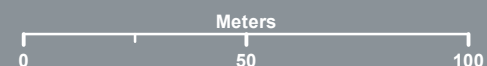


FIGURE 8B
1:1,700 Scale at A3



PFOS+PFHxS Concentrations in Groundwater - April 2021

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



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Date: 2022-01-20 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-008B_PFOS+PFHxS_Apr-21 01.mxd
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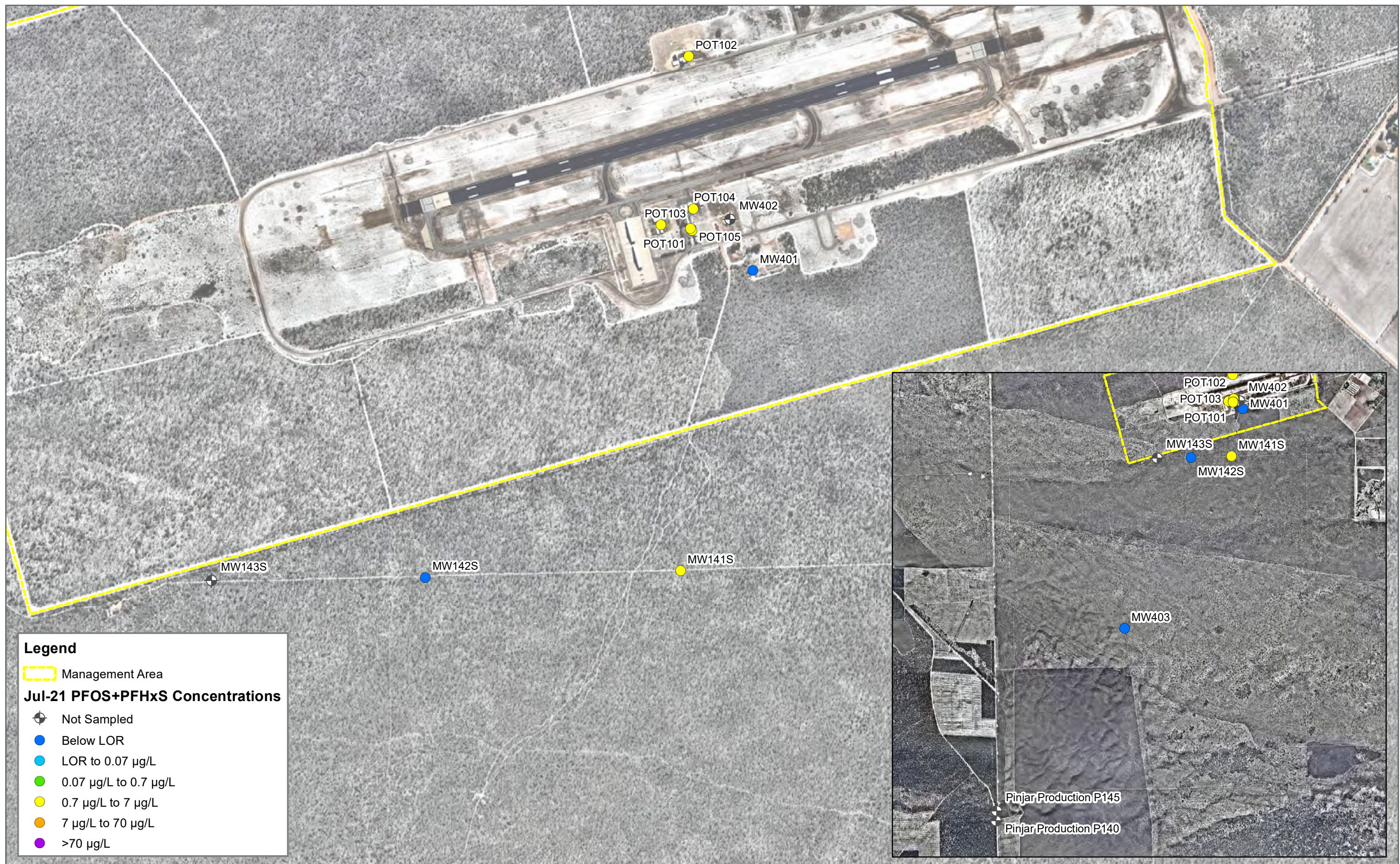


FIGURE 9
1:11,000 Scale at A3

Meters
0 200 400

**PFOS+PFHxS Concentrations
in Groundwater - July 2021**

ANNUAL INTERPRETIVE REPORT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE

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Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-009_PFOs+PFHxS_Jul-21 01.mxd
Aerial Imagery Supplied by Nearmap (March 2020)

APPENDIX

B

SAQP



now





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

Gingin Satellite Airfield

Prepared for
Department of Defence

15 June 2021



Contact Information

Cardno (WA) Pty Ltd
ABN 77 009 119 000

11 Harvest Terrace
West Perth 6005
Australia

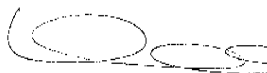
www.cardno.com
Phone +61 8 9273 3888
Fax +61 8 9486 8664

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Date 15 June 2021
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Principal/Regional WA Project Manager



Principal Environmental Geoscientist

Document History

Version	Effective Date	Description of Revision	
Rev0	15 September 2019	Internal Draft	
Rev 1	11 October 2019	Client Submission/Review	
Rev 2	6 November 2019	Final	
Rev 3	11 May 2020	SAQP review	
Rev 4	8 April 2021	SAQP review	

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Appendices

Appendix A Figures

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1 Introduction

Cardno have been engaged by the Australian Department of Defence ('Defence' or 'Client') to prepare a Sampling and Analysis Quality Plan (SAQP) as part of the Ongoing Monitoring Plan (OMP). The purpose of which is to monitor trends in the extent and concentration of per- and poly-fluoroalkyl substances (PFAS) impacts identified on and around the Royal Australian Airforce (RAAF) Gingin Satellite Airfield (the Site). The site is located in Yeal, Western Australia and is displayed in Figure 1 of Appendix A.

This SAQP applies to the "Management Area" and "Monitoring Area" as defined in the OMP (Department of Defence, 2018). The Management Area is defined as the area for which active management of risks relating to PFAS contamination are required. The Monitoring Area is defined as the area where risks relating to PFAS contamination are currently considered to be acceptably low and therefore active management of these risks is not considered necessary. However, ongoing monitoring is required to assess any changes in PFAS concentrations over time that may alter the potential risks (DoD, 2018).

For the purposes of this report:

- > Management Area was defined as Gingin Satellite Airfield (Figure 1, Appendix A).
- > Monitoring Area was defined as comprising the Site, plus the parcel of Crown Land that represents the Yeal Swamp Nature Reserve (Figure 2, Appendix A).

The Site is located on Commonwealth Land and is regulated under Commonwealth environmental legislation. The OMP outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater originating from the Site for an initial 12-month monitoring period. The 12-month monitoring period consists of biannual groundwater monitoring of all onsite groundwater wells, quarterly monitoring of taps and extraction bores onsite, and quarterly monitoring of selected offsite groundwater monitoring wells and abstraction bores.

1.1 Purpose & Objectives

The objective of the SAQP is to present the specific monitoring locations, sampling methodologies and quality control / quality assurance (QA/QC) measures for the monitoring of the concentrations and extent of PFAS in groundwater (on and off-site), tap water (non-potable) and existing extraction bores. These findings will inform risk management decisions by Defence and the Western Australian Government to protect human health and the environment.

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

- > Evaluate the nature and extent of PFAS in groundwater beyond the southern boundary of the Site;
- > Assess seasonal fluctuations in the groundwater PFAS concentrations;
- > Assess any changes in PFAS concentrations and extent in groundwater migrating from source areas, and being extracted from the underlying aquifer
- > Provide confirmation of the current understanding of risk; and
- > Provide supporting data to inform the ongoing management requirements.

1.2 Previous Reports

The following key reports prepared in relation to the Gingin Satellite Airfield PFAS Investigation have been used as a basis to develop this OMP SAQP:

- > Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.
- > Department of Defence, 2018b, Gingin Satellite Airfield PFAS Investigation, PFAS Management Area Plan.
- > Jacobs, 2018a, Preliminary Conceptual Site Model - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0001).
- > Jacobs, 2018b, Sampling, Analysis and Quality Plan - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0002).

- > Jacobs, 2018c, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0003).
- > Jacobs, 2018d, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations, Tier 2 Human Health Risk Assessment - Offsite Receptors (No. IS219200-0000- NP- RPT-0005).
- > Jacobs, 2018e, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations, Tier 3 Human Health Risk Assessment - Onsite Receptors (No. IS219200-0000- NP- RPT-0006).
- > Jacobs, 2019a, PFAS Ongoing Groundwater Monitoring Report (No. IS219200-0000-NP-RPT-0008).
- > Cardno, April 2020, PFAS OMP Factual Report – Gingin Satellite Airfield.
- > Cardno, May 2020, PFAS OMP Quarterly Sampling event Factual Report March 2020.
- > Cardno, June 2020, PFAS OMP Biannual Sampling Event Factual Report Post-summer 2020.
- > Cardno, December 2020, PFAS OMP Quarterly Sampling Event Factual Report August 2020.
- > Cardno, December 2020, PFAS OMP Biannual Sampling Event Factual Report Post-winter 2020.
- > Cardno, January 2021, PFAS OMP Quarterly Sampling Event Factual Report January 2021.
- > Cardno, April 2021, Draft PFAS OMP 2020 Annual Interpretive Report (Rev 3).

1.3 Responsible Parties

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

Table 1-1 Responsible Parties

Role	Responsibilities
Department of Defence – PFAS Investigation and Management Branch	<ul style="list-style-type: none"> ▪ Implement this OMP. ▪ Engage suitably qualified environmental consultants/contractors to carry out the works specified in the OMP
RAAF Gingin Satellite Airfield – Base Support Manager and Environment and Sustainability Manager	<ul style="list-style-type: none"> ▪ Review and approve all necessary permits required for implementation of the works outlined in the OMP.
Environmental Consultant	<ul style="list-style-type: none"> ▪ Obtain necessary permits from RAAF Gingin Satellite Airfield to implement the works outlined in the OMP. ▪ Liaise with State regulators (e.g. Department of Water and Environmental Regulation and Water Corporation) to arrange sampling of off-Site monitoring wells, as required. ▪ Undertake the monitoring activities outlined in this SAQP. ▪ Produce a monitoring report that summarises the data and findings of each monitoring event and is consistent with the requirements of this SAQP. ▪ Produce an annual interpretative report including recommendations for any potential changes in the location and frequency of sampling which may be incorporated in the revision of the OMP. ▪ Upload analytical data from each monitoring event to the relevant Defence ESdat database.
Department of Defence (lead) and Environmental Consultant	<ul style="list-style-type: none"> ▪ Liaise with off-Site private property owners to arrange private property access to conduct sampling.

1.4 Relevant Guidelines

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

- > National Environment Protection Council (NEPC), 1999, *National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013)* (ASC NEPM).
- > Heads of Environmental Protection Authority's Australia and New Zealand (HEPA), January 2020, *PFAS National Environmental Management Plan (NEMP) 2.0*.
- > Australian Standard AS 4482-2005 *Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds*.
- > Australian Standard AS 4482-1999 *Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 - Volatile substances*.
- > Standards Australia 1998. AS/NZ 5667:1998 *Water quality – sampling*.
- > Australian and New Zealand Guidelines, 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- > Department of Defence, Department of Energy, 2018, *Quality System Manual Schedule B15*.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > Department of Environment and Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*¹.
- > National Health and Medical Research Council (NHMRC), August 2019, *Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water*.

1.5 Standards of Assessment and Limitations

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

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

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

2 Site Description and Management Areas

Gingin Satellite Airfield is located approximately 55 km north of Perth within the suburb of Yeal and approximately 15 km southwest of the Gingin town centre. It covers an area of 706 hectares (ha).

The Site has operated as a Satellite Airfield since the Mid 1960s and is used by RAAF and visiting allied forces to support flying training. The RAAF operations includes firefighting services. The firefighting services are operated by a Defence contractor, Broadspectrum. There is a Fire House located on-Site which includes a fire response vehicle.

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

The majority of the buildings and associated infrastructure and support services include:

- > Power house and associated transformers and fuel infrastructure;
- > Pump house and associated water supply infrastructure;
- > Former fuel farm compound (decommissioned);
- > Fire house and adjoining vehicle refuelling area;
- > Vehicle wash down bay;
- > Runway, taxiways and air traffic control tower;
- > Aircraft hangers;
- > Administration and change rooms / crew huts (for pilots);
- > Caretaker's accommodation;
- > Asset services yard compound;
- > Buildings formerly used by Pearce Flying Club (vacated);
- > Radio tower and associated buildings.

2.1 Site Definition and Planning

For the purposes of this SAQP report, "the Site" was defined as the satellite airfield (Figure 1). A detailed description of the Site is provided in Jacob's OMP Report (Jacobs 2019).

Key Site identification details are presented in Table 2-1.

Table 2-1 Site Identification Details

Details	Description
Site Address	1 Airfield Rd, Yeal, WA, 6503
Land Description	RAAF Satellite Airfield
Owner	Commonwealth of Australia
Title Details	Lot 1 on Deposited plan 49337 Certificate of Title 192/157A
Planning Zone / Land use	Public Purposes – Commonwealth Government
Local Government Authority (LGA)	Shire of Gingin & City of Wanneroo
Boundary corner coordinate (GDA94, Zone 50)	392015.05E 6518261.57N

Source: Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.

2.2 Surrounding Land Uses and Zoning

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

Table 2-2 Surrounding Land Uses

Direction	Land Use
North	<ul style="list-style-type: none">▪ Yeal Swamp Nature Reserve (including ephemeral wetlands)
East	<ul style="list-style-type: none">▪ Duffy Road▪ strawberry farms▪ hobby farm▪ broiler farms
South	<ul style="list-style-type: none">▪ Yeal Swamp Nature Reserve
West	<ul style="list-style-type: none">▪ Yeal Swamp Nature Reserve
Other	<ul style="list-style-type: none">▪ The Site is located within the boundary of the Gnangara Underground Water Pollution Control Area (UWPCA).

3 Environmental Setting

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

Table 3-1 Key Site Details

Setting	Description
Climate	<p>The area has a Mediterranean climate with hot dry summers and cool, wet winters. The highest volume of rainfall typically occurs during the month of July with a mean monthly rainfall amount of 124 mm (BoM, 2019). The mean annual rainfall is recorded as 639.8 mm.</p> <p>February is the hottest month with maximum and minimum temperatures being 31.6°C and 18.3°C respectively. By contrast, winters are cool with July average maximum and minimum temperatures being 18.4°C and 7.7°C respectively.</p>
Topography	<p>The topography across the Site undulates and generally grades from west to east, however, the landform occupied by the Airfield has been substantially modified, regraded and levelled to accommodate the runway, infrastructure and buildings. Ground elevation generally ranges between approximately 75 – 80 mAHN, with the runway at 75 mAHN.</p>
Geology	<p>Regional Geology</p> <p>The Airfield is located on the Swan Coastal Plain, which extends up to 36 km wide and is bounded by the Darling Fault and associated Darling Scarp to the east and the Indian Ocean to the west. The Bassendean Dune System lies beneath the Site, which generally consists of calcareous sand with quartz sand. The sands inter-finger with the Guildford Clay to the east and overlies the Gngara Sand. To the west, the sands are overlain by the Tamala Limestone.</p> <p>Site Specific Geology</p> <p>Soil logging was completed during the DSI undertaken by Jacobs in 2018. The core recovery showed the superficial aquifer to be primarily characterised as a fine to coarse grained sand or silty sand to the maximum depth of investigation being 56 m below ground level (mBGL).</p> <p>Multiple sandy silt units were identified during drilling, from approximately 9-10 mbgl, 14-16 mBGL, and 20-21 mBGL. The layers were of various thicknesses, ranging from 0.1 to 2 m thick, and locally discontinuous. These silts may act as local or partially confining layers.</p>
Acid Sulfate Soil	<p>A review of the Acid Sulphate Soils (ASS) risk mapping, available on the National Map online database indicates that majority of the area encompassing the site is classified as having a low to moderate known ASS risk within 3m of soil surface but high to moderate risk beyond 3m of soil surface. There was one area in the northern portion of the site, and multiple surrounding areas that had identified a high to moderate risk of ASS occurring within 3m of the natural soil surface (DWER, 2019).</p>
Hydrology	<p>There are no permanent surface water features located at the Site. The closest water bodies to the Site include:</p> <ul style="list-style-type: none"> ▪ Lake Bambun – approximately 3km northeast, up hydraulic gradient. ▪ Bindar Lake – approximately 7.2 km to the west, down hydraulic gradient. ▪ Lake Mungala – approximately 2.2 km to the northeast, up hydraulic gradient. ▪ Lake Nambung –approximately 2.2 km to the northeast, up hydraulic gradient. ▪ Gregadoo Creek – approximately 4.0 km to the northeast, up hydraulic gradient. <p>East of the airfield is a dampland classified for conservation purposes (Jacobs, 2019d). Stormwater drainage from the site is conveyed towards the dampland via artificial channels. However, due to the sandy surface soil conditions, water readily infiltrates during rainfall events where offsite migration of stormwater occurs are rare.</p>
Hydrogeology	<p>Regional Hydrogeology</p> <p>The Airfield is located on the Gngara groundwater system, which covers approximately 2,200 km² along the coastal plain north of the Swan River to Gingin</p>

Setting	Description
	<p>and east to the Darling Scarp. It comprises four main aquifers that are of relevance to the Site:</p> <ul style="list-style-type: none"> ▪ The shallow, unconfined superficial aquifer (the Gngangara Mound). ▪ The semi-confined Mirrabooka aquifer. ▪ The deep, mostly confined Leederville aquifer. ▪ The deepest, mostly confined Yarragadee aquifer. <p>Groundwater Use</p> <ul style="list-style-type: none"> ▪ The Gngangara groundwater system is a crucial part of Perth's public water supply, but similarly supplies water for public open spaces, local agriculture and gardens (DWER, 2018). It also supports nationally significant groundwater-dependent ecosystems (GDEs), such as wetlands and Banksia woodlands. ▪ There are two abstraction bores located on the Airfield: <ul style="list-style-type: none"> - Abstraction bore 1 is located adjacent to the former Caretaker's House. This bore is understood to intersect the Leederville aquifer. Since 2010 the bore has been active and now supplies two large water tanks (each 144 kL) which are used to supply a network of fire hydrants across the Airfield. - Abstraction bore 2 is located within the Pump House compound and is understood to intersect the superficial aquifer. Groundwater from Abstraction bore 2 is extracted for non-potable use at the Airfield (including bathing, laundry, general site water supply, vehicle / equipment washdown and irrigation). Water from this bore is treated by a reverse osmosis unit and chlorine and more recently with a granular activated carbon filtration system following an upgrade of the water supply system. ▪ The Site is situated within the boundary of the Gngangara UWPCA, the central area of the Gngangara groundwater system that provides public drinking water supply, as part of the Integrated Water Supply Scheme (IWSS). The Gngangara UWPCA covers an area of nearly 815 km² within the cities of Wanneroo, Swan and Stirling, and the shires of Gingin and Chittering (Water Corporation, 2007). ▪ The Water Corporation extract water from a large number of bores for the Perth Integrated Water Supply System. The closest to site include: <ul style="list-style-type: none"> - Pinjar production bore P140 (reference code 61618216) located 7.3 km south-southwest of the Site boundary. This bore is screened from 53 – 70 mbgl which is inferred to be in the superficial aquifer; - Pinjar production bore P145 (reference code 61615123) located 7.3 km south-southwest of the Site boundary. This bore is screened from 111 – 183 mbgl which is inferred to be in the Leederville aquifer. <p>Groundwater Elevation</p> <p>During the DSI, groundwater levels varied across the Site from 66.315 mAHD to 57.30 mAHD.</p> <p>Groundwater Flow</p> <p>The regional groundwater flow direction is expected to be predominantly westwards. Based on information collected during the monitoring well gauging round completed by Jacobs (2018c), the inferred regional groundwater flow direction was interpreted as to the west-south-west. A component of groundwater flow to the south was observed in the southern portion of the Site. The groundwater gradient was calculated as approximately 0.0004.</p>
Environmental Sensitive Areas	<ul style="list-style-type: none"> ▪ The Yeal Nature Reserve and Gngangara-Moore River State Forest to the north, south and west of the Site are classified as protected areas. ▪ In addition, there are a number of smaller protection areas to the east of the Site including the Timaru Nature Reserve, Breera Road Nature Reserve and Chandala Nature Reserve. ▪ Chandala Swamp is located approximately 7.0 km to the east of the Site, at its closet point. ▪ There is a regional forest agreement approximately 15 km to the east of the Site.
Further information can be found in the OMP (DoD, 2018a) and Jacobs DSI (Jacobs 2018c).	

4 Source Areas and Risk

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

- > Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.
- > Department of Defence, 2018b, Gingin Satellite Airfield PFAS Investigation, PFAS Management Area Plan.
- > Jacobs, 2018a, Preliminary Conceptual Site Model - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0001).
- > Jacobs, 2018b, Sampling, Analysis and Quality Plan - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0002).
- > Jacobs, 2018c, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-003).
- > Jacobs, 2019, PFAS Ongoing Groundwater Monitoring Report (No. IS219200-0000-NP-RPT-0008).

4.1 Source Areas

The primary PFAS Source Areas identified based on the previous investigation reports (refer to Figure 2, Appendix A) include the following:

- > **The former fuel farm (SA01):** together with a firefighting deluge system, the former fuel farm was located at the east of the main buildings. Previous reports indicated that PFAS contamination found could have resulted from periodic testing and maintenance of this system.
- > **Firehouse and refuelling area (SA02):** located at the south of the taxiway. The refuelling area consisted of three above ground storage tanks connected to a series of fuel pumps. The firehouse was formerly used to store legacy AFFF and conduct maintenance of firefighting equipment. Indications of high PFAS presence in this areas soils and groundwater could have been due to a combination of firefighting equipment testing and maintenance activities.
- > **Powerhouse (SA03):** east of firehouse and refuelling area. Although no records of AFFF use were reported around this building, elevated concentrations of PFAS were reported in soil and groundwater.
- > **The eastern leach field (SA04):** located at the south of the firehouse. Wastewater contamination was found in this area from the sewerage system where water is disposed via an infiltration system. It is understood that PFAS contamination resulted from the historic use of this area for the testing of firefighting equipment, which involved the release of aqueous film forming foam (AFFF).

In general, the greatest PFAS concentrations were typically reported in wells correlating with the source areas identified above. Exceedances of the drinking water criteria and recreational criteria were reported in many of these locations. Additionally, tap water (non-potable) samples collected from various buildings at the Site reported exceedances of drinking water criteria and approximately half of these samples also exceeded the criteria for recreational use.

5 Data Quality Objectives

Development of data quality objectives (DQOs) for the OMP SAQP is based on guidance presented in the ASC NEPM (NEPC 2013) and are consistent with 'Gingin Satellite Airfield PFAS Investigation PFAS Ongoing Monitoring Plan' (Jacobs 2019). The DQO process comprises the following seven steps:

- > Step 1: State the problem
- > Step 2: Identify the decision/principal study question(s)
- > Step 3: Identify the Inputs into the Decision
- > Step 4: Study Boundaries
- > Step 5: Decision rules
- > Step 6: Tolerable limits on decision errors
- > Step 7: Optimisation of the data collection process

The DQOs are detailed in Table 5-1.

Table 5-1 Data Quality Objectives

Data Quality Step	Description
State the Problem	Four primary sources of PFAS contamination were identified at the Site during the DSI undertaken by Jacobs in 2018.
	Onsite Groundwater PFAS contamination in groundwater wells exceeding the investigation criteria for drinking water is evident in the shallow aquifer beneath the site. Exceedances were generally concentrated to the central area of the Site, in the vicinity of the former fuel farm, fire house, power house and firefighting equipment testing area.
	Offsite Groundwater Offsite migration of PFAS in the groundwater has been identified in the 2018 DSI, with one exceedance of the investigation criteria reported in a shallow well on the southern boundary of the Site and detections of PFAS above the LOR but below investigation criteria noted in three boundary monitoring wells.
	Tap Water An abstraction bore located on site is used to provide the Site water supply. Samples collected from this bore, as well as taps located across the Site contain concentrations of PFAS above the drinking water criteria. Some samples also reported concentrations above the criteria for the recreational use of water. While this water supply is not currently used for drinking, it is used for laundry, bathing, irrigation and other uses that may result in incidental ingestion by individuals that work at the Site.
Identify the decision/principal study question(s)	Most of the sampling locations have only been tested once or twice (i.e. limited time series/seasonal data). A robust dataset is required to assess trends in the nature, extent and magnitude of PFAS concentrations within groundwater to validate/improve the understanding of the CSM in relation to spatial and temporal variability of PFAS concentrations within the Management Area and associated receptors.
	This SAQP is to provide further data to assess the following principal study questions: <ul style="list-style-type: none"> ▪ What are the changes and trends in the nature, extent and magnitude of PFAS concentrations in the groundwater and tap water within the Monitoring Area? ▪ Has the nature, extent and magnitude of PFAS concentrations changed significantly to warrant a revision of the HHERA? ▪ Has the nature, extent and magnitude of PFAS concentrations changed significantly to warrant refinement of any existing management measures? ▪ Is the water fit for potable use? ▪ What is the level of contamination in the aquifer where the potable supply is drawn from? ▪ How is this changing over time?

Data Quality Step	Description
Identify the Inputs into the Decision	<p>The following inputs are required to resolve the principal study questions outlined in Step 2:</p> <ul style="list-style-type: none"> ▪ PFAS concentrations in groundwater, and onsite tap water ▪ Field data (i.e. groundwater levels, physio-chemical parameters) for groundwater, from previous and future monitoring events. ▪ An appropriate statistical evaluation of the data (e.g. using Mann-Kendall or similar analysis) including short- and long-term trends. ▪ Historical monitoring results from previous investigations to assess data trends (spatially and temporally). ▪ Previous factual reports by Cardno (April 2020 to January 2021). ▪ Draft PFAS OMP 2020 Annual Interpretive Report (Rev 3) (Cardno, April 2021). ▪ Comparison of data sets to relevant endorsed assessment levels (refer to Section 7).
Study Boundaries	<p>Ongoing monitoring will generally be undertaken within the boundaries of the Monitoring Area (Figure 2, Appendix A) at the groundwater, and tap monitoring locations outlined in Sections 6.</p> <p>Undertake biannual groundwater monitoring of all onsite groundwater wells, quarterly monitoring of taps and extraction bores onsite, and quarterly monitoring of selected offsite groundwater monitoring wells and abstraction bores.</p>
Develop a Decision Rule	<ul style="list-style-type: none"> ▪ The analytical and field data will be used to assess changes to the nature, extent and magnitude of PFAS in tap water, extraction bores and groundwater and to provide supporting data for assessment of management actions, where relevant. ▪ Trends in PFAS concentrations, including an assessment of temporal and spatial changes, should be assessed using an appropriate statistical analysis approach (e.g. using Mann- Kendall or similar analysis), with a specified level of confidence based upon the number of monitoring rounds completed. ▪ The analytical data will be compared to the relevant assessment levels presented in Section 8 and to the concentrations recorded during prior monitoring rounds [i.e. during the DSI (Jacobs 2018c)] to evaluate changes in the risk profile and whether revision of the HHERA or implemented management measures is warranted. <p>Where exceedances of adopted assessment criteria levels (presented in Section 7) or new detections are reported, further interrogation of data will be undertaken to the extent relevant to assess the risk profile and location. A summary of the key decision rules as detailed below:</p> <ol style="list-style-type: none"> 1. Have the analytical data collected as part of the monitoring program met the DQI (refer Table 5-2.below)? If yes, then the data can be used to answer the decision rule below and the decision statements developed in Step 2. If no, then an assessment of the need to collect additional data will be required. 2. Do PFAS concentrations exceed the investigation criteria? If no, then the contamination would be considered not to pose an unacceptable risk. If yes, do PFAS concentrations reported indicate an increasing trend or exceed historic maximum concentrations? Do results indicate a potential risk to receptors and changes to the risk profile? Further risk assessment, and potentially additional investigations, may be required to determine the potential for unacceptable impacts. 3. Has PFAS been detected in any of the off-site bores previously not detected? If yes, do PFAS concentrations reported indicate an increasing trend and/or exceed historic maximum concentrations? Do results indicate a potential risk to associated receptors including associated risks that PFAS may present towards human receptors (i.e. consumers of abstracted water). Further risk assessment, and potentially additional investigations, will be required to determine the potential for unacceptable impacts.
Specify Limits on Decision Error	<p>The potential for significant decision errors will be minimised by completing a robust QA/QC program in accordance with DWER and NEPM guideline requirements. Standard operating procedures will be closely followed in the field to ensure accurate and representative data acquisition. DQIs will be applied to assess usability of data prior to making decisions, based on precision, accuracy, representativeness, comparability and completeness. The acceptable limit on decision error is 95% compliance with the applied DQIs (see Table 5-2). If any of the DQIs are not met, further assessment will be</p>

Data Quality Step	Description
Optimise the Design for Obtaining the Data	necessary to evaluate the significance of the non- conformance and any corrective actions.
	The design of the OMP has been made in consideration of historical activities at the site, historical investigations (and findings i.e. DSI, HRE AND ERA reports), in the context of developing responses to the principal study questions outlined in Step 2 and to meet the DQOs, ensuring that a representation of the current site condition can be achieved.
	<p>The OMP scope for the first 12 months of monitoring is outlined in Section 0. Following initial implementation, the available data should be reviewed and evaluated to determine if the frequency of monitoring should increase or decrease to provide better understanding of PFAS concentration fluctuations and potential risks to receptors.</p> <p>As additional information is gathered during the course of this monitoring, it may be beneficial for the proposed scope of works to be altered from the initial design. Changes to the proposed monitoring, if considered necessary, will be made in consultation with the Client</p> <p>Other factors that will optimise the design for obtaining data will include the use of laboratories that are NATA accredited for PFAS analysis and ensure laboratory LORs are suitable to meet the relevant adopted assessment levels (where possible), experienced field scientist(s), robust field and laboratory quality assurance/quality control protocols are adopted and Field and analytical data are collected in accordance with the PFAS NEMP (HEPA 2020), ASC NEPM (NEPC 2013) and the assessment of contaminated sites (DER 2014).</p>

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

Table 5-2 Data Quality Indicators

Data Quality Indicator	Detail
QA Documentation	Provision of appropriate work plans, DQI and DQO defined for the site and all QA/QC aspects documented.
Bias	<p>A measure of the potential distortion in an analysis which can result in errors in one direction (e.g. one laboratory consistently higher results or consistent poor spiked matrix recovery).</p> <p>Bias will be assessed with reference to the analysis of spiked matrix samples (NEPC 1999b).</p>
Representativeness	A qualitative measure of the confidence that data is representative of each medium present on the site. Use of appropriate and documented sampling methods, sampling handling, preservation and transport and holding times.
Precision:	<p>A quantitative measure of data variability or reproducibility, measured by the calculation of %RPD values for duplicate samples (i.e. measure of agreement).</p> <p>Precision in DQI is considered an important assessment in an environmental study (USEPA, 2002, Guidance on Environmental Data Verification and Data Validation). It can be measured as follows:</p> <ul style="list-style-type: none"> Percentage of the mean of the measurement such as Relative Percent Difference (i.e. %RPD). The %RPD will be calculated for the field and secondary duplicate (i.e. inter and intra-laboratory analysis); and Use of similar analytical method and instrument (e.g. for inter-laboratory assessment). <p>The %RPD will be considered as acceptable if the values are less than 30% (NEPC, 2013). Should there be a result that is greater than 30% difference, then a "review should be conducted of the cause (e.g. instrument calibration, appropriateness of method used)" (NEPC, 2013).</p> <p>For the purpose of this OMP field and secondary duplicates should be collected at a rate of 1 in 10 samples (HEPA 2020).</p>
Accuracy	<p>A quantitative measure of the closeness of data to a 'true value', measured by the analysis of spike, blank and laboratory control samples (LCS). The LCS consists of a standard reference material or a matrix of known concentration.</p> <p>For the purpose of assessing accuracy it is required that at least one LCS for each process batch^[2] be analysed (NEPC, 2013).</p>
Comparability	A qualitative measure of the confidence that data may be considered to be equivalent for each sampling and analytical event. By use of standard procedures, comparable methods, qualified personnel and review of sample integrity.
Completeness	A measure of the amount of usable data (expressed as a percentage - %) from a data collection activity, based on completeness of test program, overall QA/QC completeness and validity of data set.

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

6 Ongoing Monitoring Program

6.1 OMP SAQP History

Changes and updates made to the OMP SAQP are documented in Table 6-1.

Table 6-1 OMP SAQP History

SAQP Version	Date	Report Section	Description of changes
Rev 2	06/11/2019	-	Defence review comments
Rev 3	11/05/2020	7	Update of assessment criteria and reference to HEPA (2020).
Rev 4	10/03/2021	6.3	Table 6-4 'Wells construction details' added.
			Wells ID updated as per DCARM update
			MW103S (lost) replaced by MW504 MW311 (damaged) replaced by MW505
		App A	Figures updated
		6	Methodology table updates

6.2 Monitoring Area Description

The OMP includes sampling and analysis not only from the Site, but also from off-Site Crown Land. The Site and surrounding areas are collectively referred to as the "Monitoring Area". The Monitoring Area boundaries are presented on Figure 2, Appendix A.

For Gingin Satellite Airfield, the Monitoring Area is limited to the boundary of the base, as well as the parcel of Crown Land that represents the Yeal Swamp Nature Reserve – an area that surrounds much of the southern, western and northern extents of the Base. The lateral extents of the Monitoring Area are aligned with the boundary of the adjoining Crown Lands property.

6.3 Groundwater Monitoring

6.3.1 Groundwater Monitoring Network

The network of on- and off-Site groundwater monitoring wells is summarised in Table 6-2.

Table 6-2 Gingin Groundwater Monitoring Network

Aquifer (total number of monitoring wells)	Average screen interval (mBGL)	Location (on-Site/off-Site)	Monitoring Well / Bore ID	Frequency
Shallow groundwater wells (33)	7 – 9	On-Site	0958_MW106S, 0958_MW107S, 0958_MW108S, 0958_MW109S, 0958_MW110S, 0958_MW111S, 0958_MW112S, 0958_MW113S, 0958_MW114S, 0958_MW115S, 0958_MW116S, 0958_MW119S, 0958_MW122S, 0958_MW125S, 0958_MW128S, 0958_MW137S, 0958_MW138S, 0958_MW301, 0958_MW302, 0958_MW303, 0958_MW304, 0958_MW305, 0958_MW306, 0958_MW307, 0958_MW308, 0958_MW309, 0958_MW310, 0958_MW312, 0958_MW313, 0958_MW504, 0958_MW505.	Biannual
Deep groundwater wells (9)	35 - 40	On-Site	0958_MW102D, 0958_MW105D, 0958_MW118D, 0958_MW121D, 0958_MW124D, 0958_MW130D, 0958_MW131D, 0958_MW133D, 0958_MW134D, 0958_MW136D, 0958_MW140D	Biannual

Aquifer (total number of monitoring wells)	Average screen interval (mBGL)	Location (on-Site/off-Site)	Monitoring Well / Bore ID	Frequency
Intermediate depth wells (14)	12 - 16	On-Site	0958_MW101I, 0958_MW104I, 0958_MW117I, 0958_MW120I, 0958_MW123I, 0958_MW126I, 0958_MW129I, 0958_MW132I, 0958_MW135I, 0958_MW139I	Biannual
		Off-Site	0958_MW141S, 0958_MW142S, 0958_MW143S, 0958_MW403 (DWER bore GC19)	Quarterly
Abstraction wells (4)		Off-Site	Pinjar Production P140, Pinjar Production P145	Quarterly
		On-Site	0958_MW401 & 0958_MW402 (Abstraction wells 1 and 2)	Quarterly

The groundwater wells and bores selected for monitoring are presented in Table 6-3, along with the rationale for the selection, and are shown on Figures 3A&B, Appendix A. Construction details are provided in

Table 6-3 OMP Groundwater Monitoring Locations

Area	Monitoring Well / Bore ID	Rationale
On-Site – Source Areas	Former fuel farm (SA01) - 0958_MW112S, 0958_MW113S, 0958_MW101I, 0958_MW102D, 0958_MW301, 0958_MW302, 0958_MW303	Monitoring wells within these Source Areas were found to contain PFAS at concentrations above the relevant assessment level for the Site. Monitoring of these wells will provide an understanding of the nature, extent and magnitude of PFAS concentrations owing to seasonal fluctuations or implemented management measures at the main identified Source Areas.
	Fire house and Refuelling area (SA02) - 0958_MW504, 0958_MW104I, 0958_MW105D, 0958_MW304, 0958_MW305, 0958_MW306	
	Powerhouse (SA03) - 0958_MW307, 0958_MW308, 0958_MW309, 0958_MW310	
On-Site – secondary sources	Landfills - 0958_MW106S, 0958_MW107S, 0958_MW108S, 0958_MW109S, 0958_MW110S	The monitoring will also allow refinement or implementation of additional measures to manage exposure to Site personnel working within these impacted areas.
	Sewage system and leach field (SA04): 0958_MW114S	
	Site Drainage - 0958_MW115S	
	Water Supply Infrastructure – 0958_MW505, 0958_MW312, 0958_MW313, 0958_MW111S.	
	Abstraction bore 1 - 0958_MW401	
On-site - other	Abstraction bore 2 – 0958_MW402	Detections of PFAS in exceedance of drinking water guidelines has been recorded in shallow southern boundary bore 0958_MW138_S 9 (Jacobs 2019, Jacobs 2018c). This indicates migration of groundwater offsite. Monitoring of these wells will provide an indication of any change in the nature or magnitude of PFAS migrating off-Site, and will help in determining changes attributable to seasonal fluctuations or implemented management measures.
	Airside perimeter – 0958_MW116S, 0958_MW117I, 0958_MW118D, 0958_MW119S, 0958_MW120I, 0958_MW121D, 0958_MW122S, 0958_MW123I, 0958_MW124D	
	Site boundary – 0958_MW125S, 0958_MW126I, 0958_MW128S, 0958_MW129I, 0958_MW130D, 0958_MW131D, 0958_MW132I, 0958_MW133D, 0958_MW134D, 0958_MW135I, 0958_MW136I, 0958_MW138S, 0958_MW139I, 0958_MW140D	
	Background - 0958_MW137S	
	UWPCA: Pinjar Production P140, Pinjar Production P145	
Off-Site	Public Land: 0958_MW143S, 0958_MW142S, 0958_MW141S, 0958_MW403	Monitoring of these wells will provide an indication of any change in the nature or magnitude of PFAS migrating off-Site, and will help in determining changes attributable to seasonal fluctuations or implemented management measures. The monitoring will also allow refinement of current measures, or implementation of additional measures (if necessary) to manage exposure to off-Site groundwater users.

Table 6-4 OMP Groundwater Monitoring Wells Construction Details

Well ID	Date drilled	Easting ¹	Northing ¹	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
MW101I	08/02/18	392365.354	6518050.237	73.50	23.5	19.78-22.78
MW102D	07/02/18	392362.712	6518060.772	73.41	43.4	40.02-43.02
MW104I	21/03/18	391866.667	6518104.696	73.74	22.9	19.5-22.9
MW105D	22/03/18	391865.254	6518111.631	73.79	42.3	39-42.5
MW106S	21/02/18	392300.981	6519081.431	71.54	11.0	6.8-10.8
MW107S	21/02/18	392172.956	6519059.739	71.60	9.5	5.5-9.5
MW108S	21/02/18	392172.721	6519032.509	70.90	9.0	5.0-9.0
MW109S	20/02/18	391948.725	6517949.616	73.45	10.3	5.8-10.3
MW110S	20/02/18	391965.223	6517913.989	73.74	10.0	6.5-10.0
MW111S	23/02/18	391950.19	6518080.847	73.87	9.5	6.5-9.5
MW112S	23/02/18	392220.246	6518034.27	73.69	10.5	7.5-10.5
MW113S	22/02/18	392233.637	6517959.169	73.79	9.6	6.5-9.5
MW114S	09/03/18	391857.399	6518077.121	73.68	8.0	5.0-8.0
MW115S	22/02/18	393404.748	6518871.879	70.79	8.0	5.0-8.0
MW116S	26/02/18	391180.405	6518376.095	74.43	11.0	8.0-11.0
MW117I	27/02/18	391159.363	6518372.391	74.19	23	21.3-23.3
MW118D	26/02/18	391136.531	6518361.179	74.19	43	41-43
MW119S	26/02/18	390522.99	6518100.215	74.06	13.1	10.1-13.1
MW120I	01/03/18	390524.512	6518080.028	73.84	23	19.94-22.94
MW121D	28/02/18	390527.072	6518052.331	73.96	42.8	39.8-42.8
MW122S	27/02/18	390878.357	6517687.55	75.84	13.5	10.5-13.5
MW123I	06/03/18	390842.439	6517678.613	76.03	23	20-23
MW124D	02/03/18	390860.885	6517683.114	75.87	42.5	39.5-42.5
MW125S	22/02/18	390857.354	6518977.058	74.88	18	14.25-17.25
MW126I	22/02/18	390825.625	6518968.422	73.50	36.5	33.5-36.5
MW128D	15/03/18	389901.663	6518706.163	74.40	50	47-50
MW129I	21/02/18	389866.739	6518695.714	73.51	18	15.3-18.3
MW130D	20/02/18	389833.153	6518686.763	72.77	36.5	33.5-36.5
MW131D	14/03/18	389600.508	6517902.704	76.59	55.5	52.5-55.5
MW132I	16/02/18	389608.966	6517878.026	76.43	21.0	18.5-21.5
MW133D	15/02/18	389605.327	6517890.365	76.49	43.5	40.9-43.9
MW134D	12/03/18	389870.816	6516942.416	78.48	56	53-56
MW135I	13/02/18	389881.796	6516899.339	77.67	24	21.1-23.6

Well ID	Date drilled	Easting ¹	Northing ¹	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
MW136D	14/02/18	389876.659	6516917.12	78.24	44.9	41-44
MW137S	09/03/18	394323.666	6517449.703	73.12	8.7	4.7-8.7
MW138S	14/06/18	391668.714	6517373.994	74.17	15.0	9.0-15.0
MW139I	14/06/18	391683.61	6517377.962	73.99	30.0	27.0-30.0
MW140D	13/06/18	391694.005	6517380.345	73.90	54.0	51.5-54.5
MW141S	06/03/19	391915.097	6516990.331	74.36	16.5	13.5-16.5
MW142S	05/03/19	391116.695	6516968.991	76.34	15.5	12.4-15.4
MW143S	05/03/19	390447.934	6516958.991	75.81	18.5	14-18.5
MW301	13/04/12	392437.274	6518067.714	74.547	10	7-10
MW302	13/04/12	392406.8485	6518042.406	74.712	10	7-10
MW303	13/04/12	392404.5085	6518050.688	74.574	10	7-10
MW304	18/04/12	391935.1745	6518126.53	74.094	9.5	6.5-9.5
MW305	18/04/12	391913.0305	6518125.358	73.885	9	6.0-9.0
MW306	18/04/12	391914.8445	6518118.044	73.965	9	6.0-9.0
MW307	17/04/12	392002.4455	6518149.752	73.635	8.5	5.5-8.5
MW308	17/04/12	391964.2945	6518151.916	73.691	9	6.0-9.0
MW309	17/04/12	391967.1975	6518140.975	73.899	9.5	6.5-9.5
MW310	17/04/12	391958.6615	6518146.062	73.806	9	6.0-9.0
MW312	16/04/12	392041.0045	6518075.125	74.541	9.5	6.5-9.5
MW313	16/04/12	392043.0275	6518069.532	74.688	10.5	7.5-10.5
MW401	-	392140.5162	6517928.635	N/A	N/A	N/A
MW402	-	392069.7036	6518088.4608	N/A	N/A	N/A
MW403	28/07/1977	389846.389	6513602.556	73.84	26	14-26
MW504	14/10/20	391887.555	6518145.096	72.82	13.0	10.0-13.0
MW505	14/10/20	391972.852	6518036.711	73.832	13	10-13

Notes:

1. MGA94 zone 50

RL – Relative Level

TOC – Top of Casing

6.3.2 Monitoring Frequency

Initially, the OMP is proposed to be implemented for a twelve-month period, at which point the scope of the ongoing monitoring would be re-evaluated. Groundwater samples will be collected from selected monitoring wells at the frequency outlined below:

- > Biannual monitoring of all onsite groundwater wells. This frequency is considered appropriate to capture seasonal change in groundwater levels and flow direction, as well as corresponding changes in PFAS concentration in the vicinity of and immediately beyond the identified source zones. Quarterly monitoring of offsite wells is detailed in point three below to monitor risk to identified receptors.
- > Sampling from selected taps and abstraction bores at the Site on a quarterly basis
- > Monitoring of selected offsite groundwater monitoring wells and abstraction bores on a quarterly basis, specifically:
 - Two WA Water Corporation production bores (Pinjar Production Bore P145 and P140)
 - Four shallow groundwater monitoring wells located between the WA Water Corporation bores and the Site boundary (including the three new wells identified for installation in Section 3.3.2)
- > In relation to the two WA Water Corporation production bores, these are currently being sampled by WA Water Corporation. It is anticipated that this will continue to occur on a quarterly basis with this sampling frequency to be reviewed after a two-year period. Results provided to Defence for review.

Biannual sampling will be undertaken post-summer (March/April) and post-winter (September/October) while additional quarterly events will occur in June/July and December/January.

6.3.3 Groundwater Sampling Methodology

Groundwater sampling methodology are detailed in the following sections.

6.3.3.1 Groundwater Monitoring Wells

Groundwater monitoring will be undertaken by no purge HydraSleeve® method as detailed in Table 6-5. Extraction bores will be sampled as per the tap water methodology outlined in Section 6.4.

Table 6-5 Groundwater Monitoring Wells – Sampling Method

Activity	Details
Well Gauging	<p>Standing Water Level (SWL) will be gauged in each well prior to sampling using an interface probe. All wells will be measured against a specified mark at the top of the well casing.</p> <p>A selection of wells including both shallow and deep will be gauged in a snap gauging event on the first day of sampling for the purpose of inferring the groundwater contours and flow direction..</p>
Groundwater Field Parameters	<p>Groundwater field parameters will be recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters will be recorded using a water quality meter:</p> <ul style="list-style-type: none"> ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement will be recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) will be calibrated by the equipment supplier and daily readings of reference solutions (bump tests) completed to optimise the accuracy of the measurements taken.</p>
Deployment of HydraSleeve	<p>HydraSleeve will be deployed with top weight sample collection to begin at the lowest point.</p>

Activity	Details
Retrieval of HydraSleeves (Sample Collection)	<p>HydraSleeve sampling devices will be left in wells for a minimum of 4 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment.</p> <p>Samples will be collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples will be discharged immediately (minimise changes in chemistry) via discharge tube.</p>
Alternative sampling methodology (hand bailing)	<p>Disposable HDPE hand bailers, attached to a polypropylene string, will be used in the event that the water column isn't sufficient to fill the hydrasleeve. Purging of the well (i.e. removal of 3x well volume) will be undertaken prior to sampling to ensure that a sample representative of the aquifer is taken.</p>
Field Records	<p>Field records will include the following information:</p> <ul style="list-style-type: none"> Sampling time, date and name of the sampler. Weather conditions. Sample Collection method. Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised. Calibration and daily bump test records. <p>All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures will be retained within project files.</p>
Decontamination procedure	<p>Dedicated HydraSleeves will be used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment will be thoroughly washed using phosphate-free detergent (Decon 90), then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample will be labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples will be collected directly in into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times will be undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p> <ul style="list-style-type: none"> All holding times will comply with the requirements set out in "Australian Standard AS/NZS 5567.1:1998 and AS 4482.1".
Laboratory Testing	<p>Allowance for the following analysis per groundwater bore:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (see Appendix B). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance) in order to assess the connectivity between the shallow and deep water table. Dissolved Organic Carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH to assess spatial and temporal changes in general water quality.
Laboratory Testing – Quality Control	<p>Groundwater QC samples will be collected at the following frequencies as detailed in the OMP:</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 20 samples. Field triplicate (inter-laboratory) samples at 1 per 10 water samples should be sent to a secondary laboratory. Rinsate blank sample at 1 per day per sampler [collected off re-used sampling equipment (e.g. interface probe)]. Field blank samples at 1 per day per sampler. Additional sample volume will be collected to allow for laboratory internal QA/QC.

Activity	Details
Laboratory Accreditation and Limits of Reporting	<p>All groundwater analysis will be undertaken by laboratories accredited by the NATA.</p> <ul style="list-style-type: none">▪ Primary analysis will be undertaken by ALS Global Laboratories (Perth)▪ Secondary analysis will be undertaken by Eurofins (Perth). <p>Laboratory LORs will be suitable to meet the relevant adopted assessment levels (0.01 µg/L).</p>

6.4 Tap Water Monitoring

The Tap water locations are presented on Figures 3A&B (Appendix A) and are summarised in Table 6-6.

Table 6-6 Summary of Tap Water Monitoring Locations

Monitoring locations	Rationale	Monitoring Frequency
0958_POT101	Sewage Treatment Area: Tap within a hut located adjacent to the eastern leach field.	Quarterly
0958_POT102	Air Traffic Control Tower: External tap at the air traffic control tower.	
0958_POT103	Crew Hut: External tap at the crew huts	
0958_POT104	Fire House: Internal tap at the kitchen sink in the Fire House	
0958_POT105	Former Pearce Flying Club Rooms: External tap outside the former Pearce Flying Club building.	

6.4.2 Extraction bores and tap water Sampling Methodology

Water samples from extraction bores and taps will be collected via the 'first flush' sampling method. The primary objective of the 'first flush' sampling method is to collect groundwater representative of the user, who may not purge the water line.

The 'first flush' sampling method involves collecting the first draw of water from the bore outlet tap. Field parameters (pH, temperature, EC, ORP and DO) will be recorded post sampling collection via flow cell, samples will be analysed for the same analytical suite as the groundwater monitoring wells (see Table 6-5).

7 Assessment Criteria

7.1 Groundwater and Tap water

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

Table 7-1 Criteria for Groundwater and Tap Water

Location	Adopted Assessment Criteria	
Groundwater and tap water	Human Health	Ecological
On-Site and Off-Site	Drinking water: <ul style="list-style-type: none"> PFOS + PFHxS – 0.07 µg/L PFOA – 0.56 µg/L 	-
	Recreational Use: <ul style="list-style-type: none"> PFOS + PFHxS – 2.0 µg/L PFOA – 10 µg/L 	

8 Reporting

8.1 Factual Reporting

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

- > Introduction.
- > Scope of work completed.
- > Description of sampling methodologies used.
- > Field observations (e.g. condition of monitoring wells, description of purged water) and water quality parameter measurements.
- > Summary of any changes to the monitoring network condition that may affect data integrity, or require rectification works, and recommendations for repair, replacement or decommissioning of a location.
- > Evaluation of the applicability of adopted assessment levels.
- > Review of the suitability of the data for assessment purposes (QA/QC evaluation).
- > Summary tables presenting gauged groundwater levels.
- > Presentation of inferred groundwater contours and inferred groundwater flow direction in a figure.
- > Summary tables of analytical results in comparison to adopted assessment levels.
- > Graphs showing historical concentrations of PFOS, PFOA and PFOS plus PFHxS.
- > Laboratory reports, Chain of Custody (CoC) documentation, field sampling records, data validation and QA/QC details, equipment calibration certificates and other relevant documentation.

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

8.2 Interpretative Reporting

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

- > The factual information described in Section 8.1.
- > Evidence of compliance with the requirements of the SAQP and meeting stated objectives of the OMP.
- > Relevant figures depicting sampling locations and site specific hydrogeological features.
- > Laboratory results and analysis including comparison with relevant screening criteria as identified in each OMP.
- > Assessment and commentary on appropriate Quality Assurance/ Quality Control (QA/QC) procedures.
- > A discussion of analytical results in relation to the following:
 - Trends in PFAS concentrations, including an assessment of temporal changes and/or changes to the extent of PFAS impacts. Trends should be assessed using an appropriate statistical analysis approach (e.g. using Mann-Kendall or similar analysis), with a specified level of confidence based upon the number of monitoring rounds completed.
 - Consideration, based on data trends, as to whether any of the existing remediation / management measures should be re-assessed, with a view to potential modification, supplementation or cessation.
 - Assessment of whether changes to the CSM and/or risk assessment are required.
 - Whether recalibration or changes to the groundwater model are required to provide a better understanding of the potential future extent of PFAS impact in groundwater.

-
- > Based on the data obtained, an assessment of the OMP sampling requirements with a view to establishing whether:
 - The number of locations monitored could be reduced, such as where PFAS concentrations are stable and are considered to present a low risk to receptors.
 - Additional monitoring locations are required, including the installation of new monitoring wells or sampling of additional existing wells (and/or private bores) to provide better understanding of the nature, extent or magnitude of PFAS impacts in a particular portion of the Monitoring Area.
 - The frequency of monitoring should increase or decrease to provide better understanding of PFAS concentration fluctuations and potential risks to receptors.
 - Monitoring of additional media should be included in the OMP.
 - > An overview of remedial works or construction and maintenance activities undertaken in the management area during the reporting period, which may impact the CSM.
 - > A statement as to whether the risk profile has changed overall, or for any specific location at the Site, and a recommendation as to whether this should trigger an OMP and/or PMAP review, or other action.

9 References

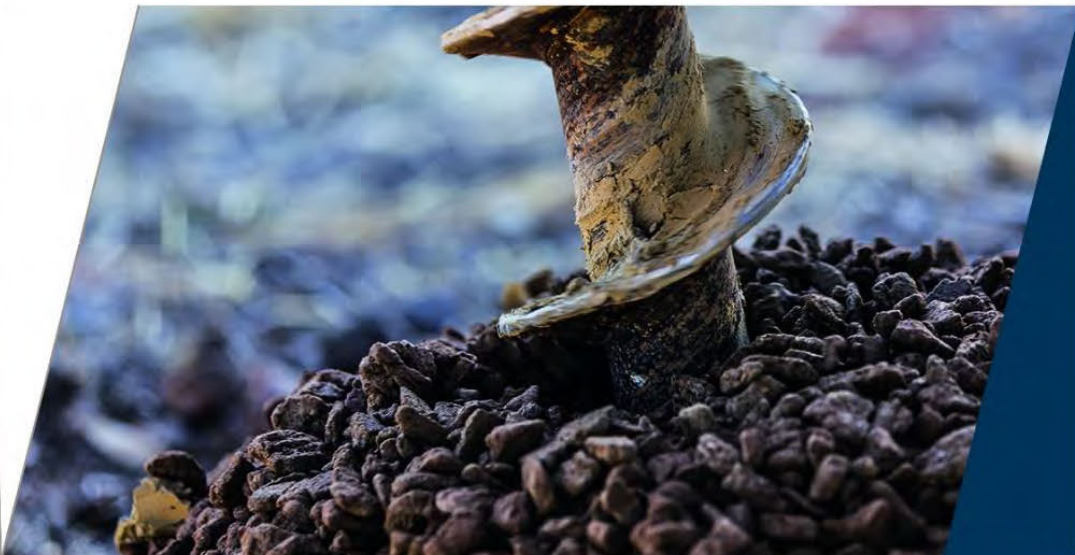
General References

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11. National Health and Medical Research Council (NHMRC) (2011 – updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
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14. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
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Site Specific References

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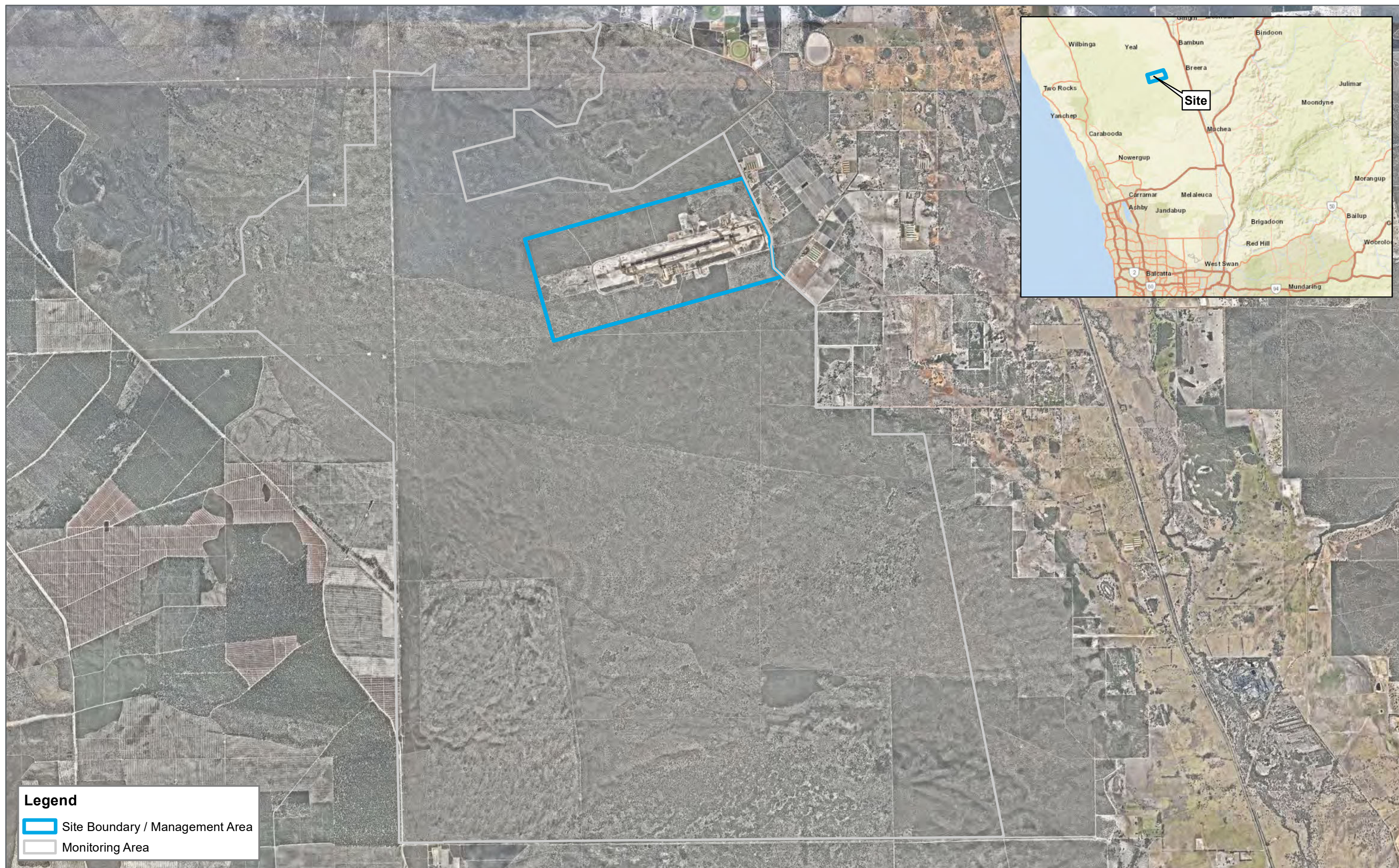
-
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APPENDIX

A

Figures



Legend

Site Boundary / Management Area

Monitoring Area

FIGURE 1
 1:60,000 Scale at A3

Meters

0 1,000 2,000

Site Location

**SAMPLING AND ANALYSIS QUALITY PLAN
 GINGIN SATELLITE AIRFIELD
 DEPARTMENT OF DEFENCE**



Map Produced by Cardno WA
 Date: 2021-06-12 | Project: DEF19009
 Coordinate System: GDA 1994 MGA Zone 50
 Map: DEF19009_WA_0958-GS-001_RegionalLocation 02.mxd
 Aerial Imagery Supplied by Nearmap

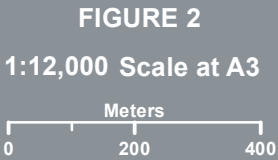
Source Area	Description
SA01	Former Fuel farm
SA02	Firehouse, refuelling area and washdown bay
SA03	Powerhouse
SA04	Eastern Leach Field



Legend

 Management Area

 PFAS Source Areas (Jacobs, 2019)

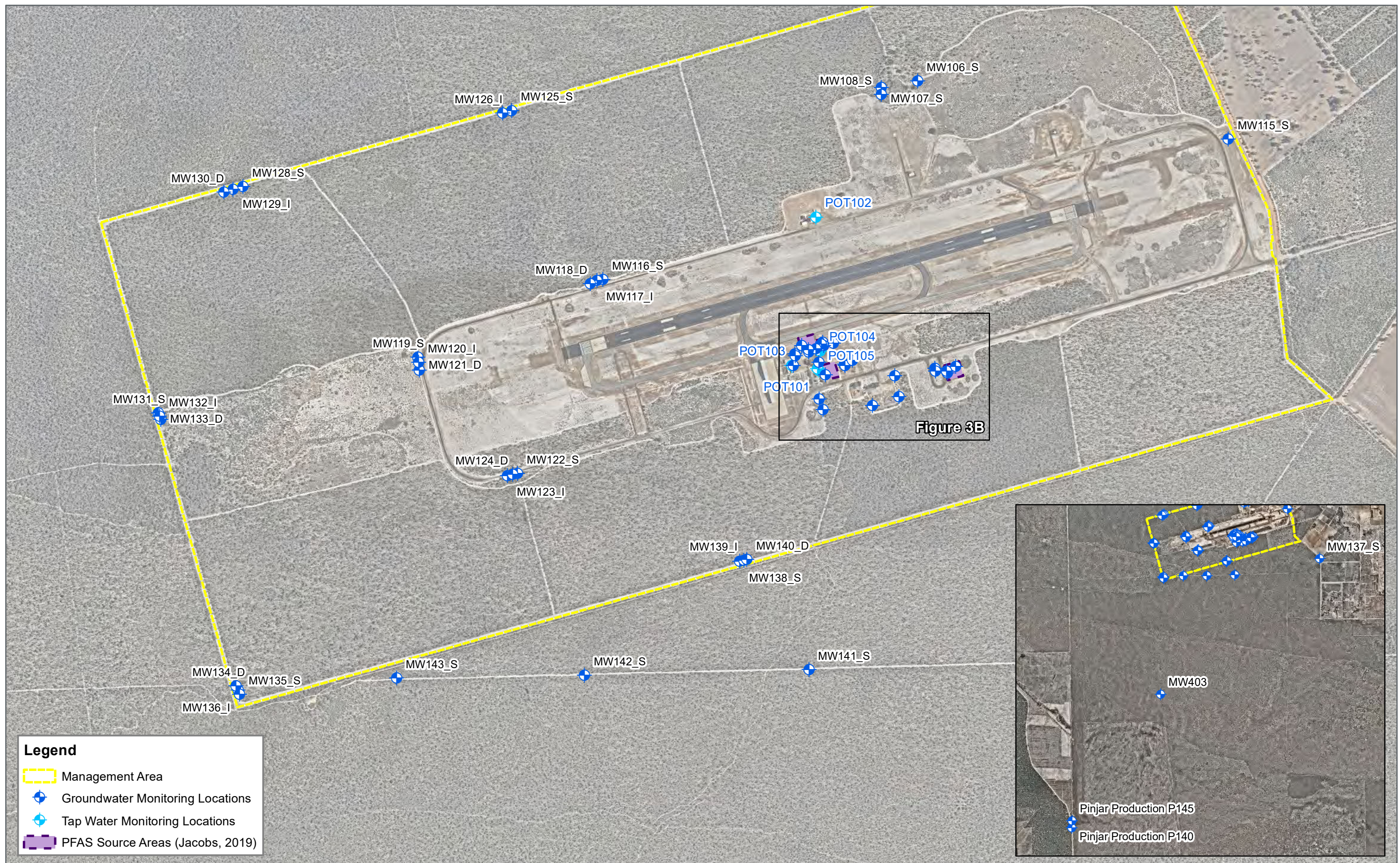


Management Area

SAMPLING AND ANALYSIS QUALITY PLAN
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
 Date: 2021-06-12 | Project: DEF19009
 Coordinate System: GDA 1994 MGA Zone 50
 Map: DEF19009_WA_0958-GS-002_ManagementAreas 02.mxd
 Aerial Imagery Supplied by Nearmap (January 2021)



Legend

- Management Area
- Groundwater Monitoring Locations
- Tap Water Monitoring Locations
- PFAS Source Areas (Jacobs, 2019)

FIGURE 3A
1:12,500 Scale at A3

Meters

0 200 400

Monitoring Locations

SAMPLING AND ANALYSIS QUALITY PLAN
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



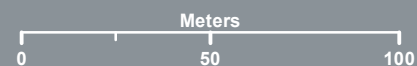
Map Produced by Cardno WA
Date: 2021-06-12 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-003A_GroundwaterMonitoringLocations 03.mxd
Aerial Imagery Supplied by Nearmap (January 2021)



Legend

- Groundwater Monitoring Locations
- Tap Water Monitoring Locations
- PFAS Source Areas (Jacobs, 2019)

FIGURE 3B
1:2,000 Scale at A3

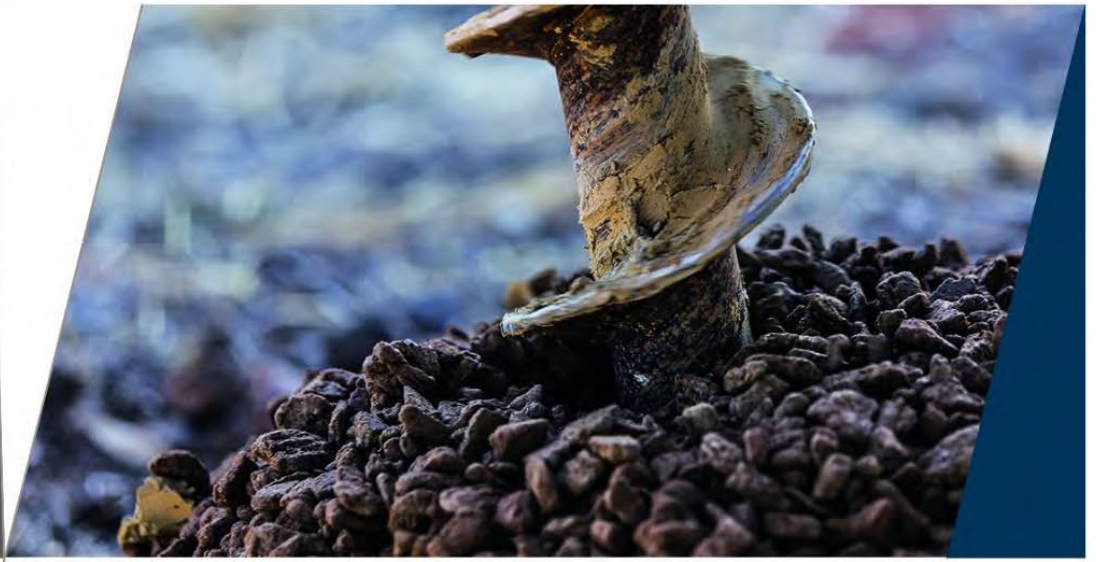


Monitoring Locations

SAMPLING AND ANALYSIS QUALITY PLAN
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-12 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-003B_GroundwaterMonitoringLocations 03.mxd
Aerial Imagery Supplied by Nearmap (January 2021)



APPENDIX

B

Full PFAS Analytical Suite

Full PFAS Analytical Suite

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



About Cardno

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



APPENDIX

C

FACTUAL REPORTS



now



PFAS OMP Biannual Sampling Event Factual Report

Post-Winter 2020

Gingin Satellite Airfield

DEF19009



Prepared for
Department of Defence

21 December 2020

Contact Information

Cardno (WA) Pty Ltd

ABN 77 009 119 000

11 Harvest Terrace
West Perth WA 6005
Australia

www.cardno.com

Phone +61 8 9273 3888

Fax +61 8 9486 8664

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Job Reference	DEF19009
Date	21 December 2020
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Senior Environmental Engineer



Principal / Regional WA Project Manager

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
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Rev 0	17/11/2020	Client Submission / Review		
Rev 1	17/12/2020	Rev 1		

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

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Chemical Names

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

Technical Terms

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

Units

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

Site Specific

OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) at Royal Australian Air force (RAAF) Gingin Satellite Airfield (“the site”). The site is located in Yeal, Western Australia and is displayed in Figure 1 of Appendix A.

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

- > Cardno, 11 May 2020, Reference: DEF19009, ‘PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Gingin Satellite Airfield’.

The SAQP was reviewed prior to the monitoring event. The following changes were made:

- > Monitoring location MW103_S was replaced by MW504; and
- > Monitoring location MW311 was replaced by MW505.

For the purposes of this report:

- > Management Area was defined as Gingin Satellite Airfield.
- > Monitoring Area was defined as comprising the Site, plus the parcel of Crown Land that represents the Yeal Swamp Nature Reserve – an area that surrounds much of the southern, western and northern extent of the Base. The lateral extents of the Monitoring Area are aligned with the boundary of the adjoining Crown Lands property (Figure 1, Appendix A).

1.2 Purpose & Objectives

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

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

The objectives of the report are:

- > To provide a succinct summary of the 2020 post-winter sampling event and provision of analytical results with supporting tables and figures.
- > To provide confirmation of the current understanding of risk.
- > To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

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

- > National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).
- > Heads of Environmental Protection Authority’s Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.
- > Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.
- > Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

- > Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites¹.
- > Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

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

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in accordance with the SAQP (Cardno, 2020), applying methods set out in section 3 of this report. The groundwater bores monitored as part of the OMP are presented in Table 2-1, and are shown on Figures 2A & 2B, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
On-Site – Source Areas	Former fuel farm (SA01) - 0958_MW112_S, 0958_MW113_S, 0958_MW101_I, 0958_MW102_D, 0958_MW301, 0958_MW302, 0958_MW303.
	Fire house and Refueling area (SA02) - 0958_MW504, 0958_MW104_I, 0958_MW105_D, 0958_MW304, 0958_MW305, 0958_MW306.
	Powerhouse (SA03) - 0958_MW307, 0958_MW308, 0958_MW309, 0958_MW310.
	Landfills - 0958_MW106_S, 0958_MW107_S, 0958_MW108_S, 0958_MW109_S, 0958_MW110_S.
On-Site – secondary sources	Sewage system and leach field (SA04): 0958_MW114_S
	Site Drainage - 0958_MW115_S
	Water Supply Infrastructure – 0958_MW505, 0958_MW312, 0958_MW313, 0958_MW111_S
	Abstraction bore 1 - 0958_MW401
On-site - other	Abstraction bore 2 – 0958_MW402
	Airside perimeter – 0958_MW116_S, 0958_MW117_I, 0958_MW118_D, 0958_MW119_S, 0958_MW120_I, 0958_MW121_D, 0958_MW122_S, 0958_MW123_I, 0958_MW124_D
	Site boundary – 0958_MW125_S, 0958_MW126_I, 0958_MW128_S, 0958_MW129_I, 0958_MW130_D, 0958_MW131_S, 0958_MW132_I, 0958_MW133_D, 0958_MW134_D, 0958_MW135_S, 0958_MW136_I, 0958_MW138_S, 0958_MW139_I, 0958_MW140_D
Off-Site	Background - 0958_MW137_S
	Water Corporation Production bores⁽¹⁾: Pinjar Production P140, Pinjar Production P145
	Public land⁽²⁾: 0958_MW143_S, 0958_MW142_S, 0958_MW141_S, 0958_MW403

Note: (1) These are currently being sampled by the Water Corporation and results provided to Defence for review.

(2) Yeal Swamp Nature Reserve managed by the Department of Parks and Wildlife (DPaW) / Vacant Crown Land managed by the Department of Planning, Lands and Heritage (DLPH)

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

2.2 Tap Water Monitoring

Tap water samples were collected from the tap water monitoring locations listed in Table 2-2 and shown on Figures 2A & 2B, Appendix A. Sampling was conducted in accordance with the SAQP (Cardno, 2020), and sampling methodology detailed in section 3.2 of this report.

Table 2-2 Tap Water Monitoring Locations

Monitoring Area	Location ID
On-Site	0958_POT101;
	0958_POT102;
	0958_POT103;
	0958_POT104;
	0958_POT105.

2.3 Data Management

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

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

2.3.1 Defence ESdat database

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

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

2.4 Deviations from the OMP SAQP

Deviations from the SAQP for the 2020 Post-Winter monitoring event are presented in Table 2-3

Table 2-3 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
MW101_I, MW107_S, MW108_S, MW111_S, MW119_S, MW143_S.	Not Sampled	These wells were found dry
MW114_S, MW305, MW306	Sampling Method	These wells did not contain enough water column for a sample to be collected with hydrasleeves. A disposable HPDE bailer was used for sampling.
MW304, MW305, MW306 (QC103), MW307, MW308, MW309, MW310, MW313 (QC104), MW401	Laboratory Analysis	Inorganics (Major anions and cations), pH, TSS, TDS were not analysed as the laboratory accidentally discarded the samples prior to analysis.
Pinjar Production P140, Pinjar Production P145	Not Sampled	No data has been obtained for these two samples.
-	QA/QC - Field Replicates below target frequency	Field duplicate and triplicate samples were collected at a rate of 7%; below the target frequency of 10%. This is not considered to significantly affect the data quality as the replicate samples that were taken had acceptable RPD results.

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken by no purge HydraSleeve® method as detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) were gauged using an interface probe. All wells were measured against a specified mark at the top of the well casing.
Groundwater Field Parameters	<p>Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) were calibrated by the equipment supplier to optimise the accuracy of the measurements taken. Calibration certificates are provided in Appendix D.</p>
Deployment of HydraSleeve	HydraSleeve were deployed with top weight sample collection to begin at the lowest point.
Retrieval of HydraSleeves (Sample Collection)	<p>HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment.</p> <p>Samples were collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples were discharged immediately (minimise changes in chemistry) via discharge tube.</p>
Hand bailing	Disposable HDPE hand bailers, attached to a polypropylene string, were used at wells where the water column wasn't sufficient to fill the hydrasleeve. Purging of the well was undertaken prior to sampling to make sure that a sample representative of the aquifer is taken.
Decontamination procedure	<p>Dedicated HydraSleeves were used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p>
Laboratory Testing	<p>Groundwater samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance).

Activity	Details
	<ul style="list-style-type: none"> Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. <p>The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix D.</p>

3.2 Tap Water Sampling Methodology

Water samples from extraction bores and taps were collected via the 'first flush' sampling method. The primary objective of the 'first flush' sampling method is to collect water representative of the user, who may not purge the water line.

Field parameters (pH, temperature, EC, ORP and DO) were recorded post sampling collection, tap water samples were analysed for the same analytical suite as the groundwater monitoring wells.

3.3 Quality Control / Quality Assurance

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

- > QA documentation.
- > Bias.
- > Data Representativeness.
- > Data Precision & Accuracy.
- > Laboratory Performance.
- > Data Comparability.
- > Data Set Completeness.

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

Field duplicate and triplicate samples were collected at a rate of 7%; below the target frequency of 10%. This is not considered to significantly affect the data quality as the replicate samples that were taken had acceptable RPD results. The QA/QC review concluded that there are no significant systematic errors in the data collection process and therefore, the dataset used for the assessment is considered valid and complete.

3.4 Assessment Criteria

3.4.1 Groundwater and Tap Water

The adopted assessment criteria for groundwater and tap water are detailed in Table 3-2.

Table 3-2 Criteria for Groundwater and tap water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS + PFOS µg/L	PFOA	
Human Health - Drinking Water Quality Guideline	0.07	0.56	HEPA 2020
Human Health – Recreational Water	2	10	NHMRC 2019, HEPA 2020

4 Field Observations and Results

4.1 Groundwater

4.1.1 Summary of Field Observations

4.1.1.1 Physicochemical parameters

Stabilised physicochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling records, included in Appendix D. Parameters for each aquifer unit were generally consistent with the previous monitoring events.

4.1.1.2 Groundwater Elevation and Migration

Groundwater flow was interpreted to be in a southwesterly direction, which is consistent with regional groundwater flow direction.

Groundwater elevations in the shallow aquifer were recorded between 56.71 mAHD at monitoring bore MW135_S and 66.96 mAHD at bore MW307.

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

4.1.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria, data assessment tables are provided in Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figures 2A & 2B in Appendix A present the groundwater monitoring locations where a first time detection of Sum of Per-fluoro-octane Sulfonate (PFOS) and Per-fluoro-hexane Sulphonate (PFHxS) or Per-fluoro-octanoic Acid (PFOA) or a new exceedance of guideline values were reported. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	MW301, MW302, MW303.	0.56 ²	1.24 (MW301)	52	3
Sum of PFHxS and PFOS	MW102_D, MW104_I, MW105_D, MW109_S, MW110_S, MW112_S, MW114_S, MW115_S, MW116_S, MW123_I, MW138_S, MW141_S, MW301, MW302, MW303, MW304, MW305, MW306, MW307, MW308, MW309, MW310, MW312, MW313, MW402, MW504, MW505.	0.07 ²	40.5 (MW301)	52	25

Note:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > MW302 (former fuel farm) reported a first exceedance of the drinking water guideline for PFOA (detected PFOA concentration = 0.66 µg/L). This bore had previously reported exceedances of the drinking water guideline for Sum of PFOS and PFHxS.
- > MW110_S (landfills) reported a first exceedance of the drinking water guideline for Sum of PFOS and PFHxS.

- > MW137_S, located upgradient of the Management Area, reported a first time detect of Sum of PFOS and PFHxS. This bore is regularly found dry and has only been sampled twice since the 2018 DSI. No detectable concentrations of PFOA were ever reported for this monitoring location.
- > No further sampling of bores P140 and P145 has been undertaken since June 2019 as the Water Corporation has been developing and finalising a PFAS response protocol. The Corporation anticipates recommencing PFAS sampling in 2021.

4.2 Tap Water

4.2.1 Summary of Field Observations

Stabilised physiochemical parameters and observations recorded during the tap water sampling event are presented in field sampling record sheets, included in Appendix D.

4.2.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria, data assessment tables are provided in Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figures 2A & 2B in Appendix A present the tap water monitoring locations where a first time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. The laboratory reports are provided in Appendix C.

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

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	0.56 ²	0.03 (POT104)	5	0
Sum of PFHxS and PFOS	POT101, POT102, POT103, POT104, POT105	0.07 ²	0.87 (POT104)	5	5

Note:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > No first time detect of PFOA or Sum of PFOS and PFHxS were reported for the tap water locations.
- > All five tap water samples reported Sum of PFOS and PFHxS concentrations above the drinking water guideline value but below the recreational use value.
- > All five tap water samples reported a detectable concentration of PFOA (i.e. above laboratory LOR) but below the adopted assessment criteria.

4.3 Changes to the Monitoring Network Condition

Replacement bores for MW103_S and MW311 were installed and MW308 and MW124_D were repaired prior to the OMP monitoring event.

No other changes to the monitoring network condition were observed.

5 Summary and Conclusions

Cardno undertook the 2020 Post-Winter groundwater and tap water monitoring event at Gingin Satellite Airfield as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 52 monitoring bores and five (5) tap water locations. Six (6) monitoring wells could not be sampled as the wells were found dry.

Groundwater levels were gauged in all wells before sampling. Groundwater flow was interpreted to be in a southwesterly direction, consistent with previous monitoring events.

The groundwater laboratory results reported the following:

- > Of the 52 samples that were tested, PFOA (3 samples), and Sum of PFHxS and PFOS (25 samples) reported concentrations that exceeded adopted assessment criteria.
- > One (1) groundwater sampling location reported a first exceedance of the drinking water guideline for Sum of PFOS and PFHxS.
- > Bore MW137_S reported a first time detect of Sum of PFOS and PFHxS. It is however noted that this bore is regularly found dry and has only been sampled twice since the DSI (2018). This bore has been considered to represent background concentrations, however, results indicate the location may be affected by site operations. Further monitoring events will confirm the contamination status.
- > PFAS concentrations at the groundwater locations sampled during the Post-Winter 2020 monitoring event were generally of the same magnitude of order as historical monitoring events.

The tap water laboratory results reported the following:

- > All five samples reported Sum of PFOS and PFHxS concentrations above adopted assessment criteria.
- > None of the five samples reported exceedances of the adopted assessment criteria for PFOA.
- > PFAS concentrations were generally within the historical range for all tap water locations monitored.

The next OMP sampling event for Gingin Satellite Airfield will be the quarterly monitoring event (Q1 2021), scheduled for January 2021.

6 References

General References

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

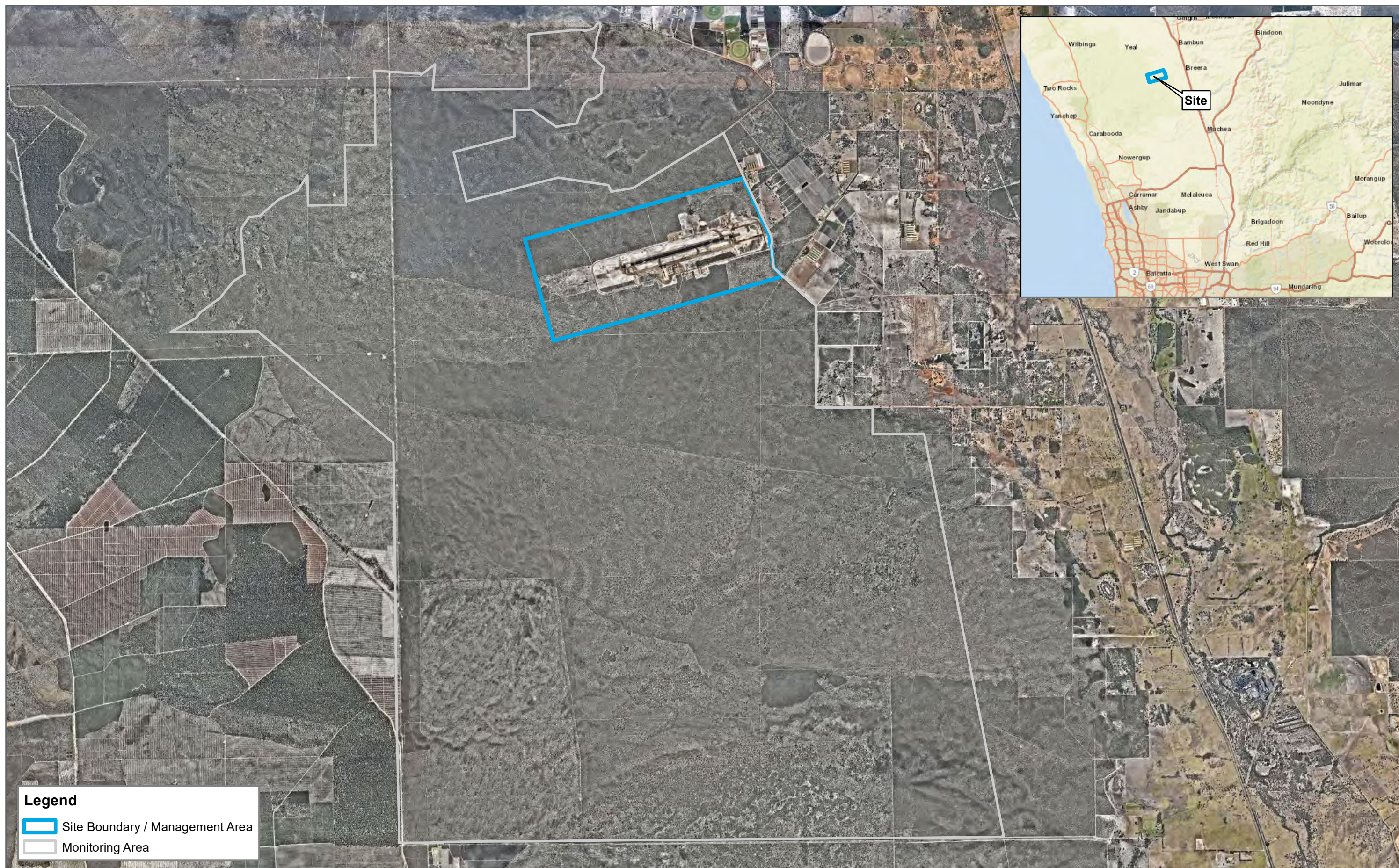
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17. Cardno, April 2020, PFAS OMP, Biannual Monitoring Factual Report
18. Cardno, 2019, PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan.
19. Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.
20. Department of Defence, 2018b, Gingin Satellite Airfield PFAS Investigation, PFAS Management Area Plan
21. Jacobs, 2018a, Preliminary Conceptual Site Model - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0001).
22. Jacobs, 2018b, Sampling, Analysis and Quality Plan - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0002).
23. Jacobs, 2018c, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-003).
24. Jacobs, 2018d, Tier 2 Human Health Risk Assessment – Offsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0005).
25. Jacobs, 2018e, Tier 3 Human Health Risk Assessment – Onsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0006).
26. Jacobs, 2019, PFAS Ongoing Groundwater Monitoring Report (No. IS219200-0000-NP-RPT-0008).

APPENDIX

A

FIGURES



Legend

Site Boundary / Management Area

Monitoring Area

FIGURE 1
1:60,000 Scale at A3

Meters

0 1,000 2,000

Site Location

BIANNUAL SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-12 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Nearmap





FIGURE 2B
1:2,000 Scale at A3

Meters
0 50 100

Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-002B_2020Q4PFASResults 01.mxd
Aerial Imagery Supplied by Nearmap (March 2020)

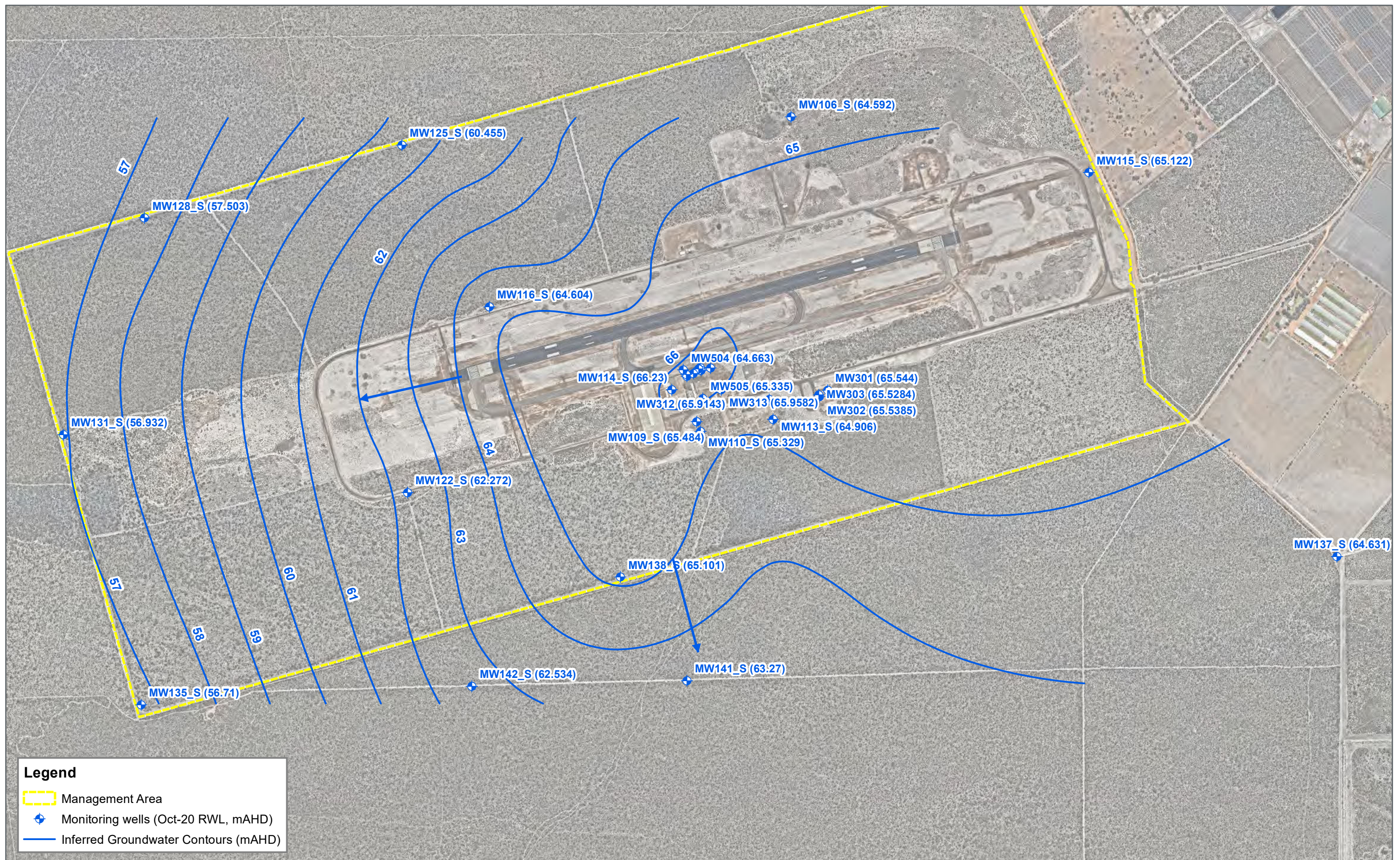


FIGURE 3
1:13,000 Scale at A3

Meters
0 200 400

Inferred Groundwater Contours (Shallow Aquifer)

BIANNUAL SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-003_2020Q4ShallowGWContours 01.mxd
Aerial Imagery Supplied by Nearmap (October 2020)

APPENDIX

B

DATA ASSESSMENT TABLES

					Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids						
					Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQI					0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02
Human Health - Drinking water criteria															0.56		
Human Health - Recreational Use criteria															10		
Area	Lab Report Number	Field ID	Location Code	Date													
Former Fuel Farm	EP2011490	0958 MW102 201021	MW102 D	21/10/2020	0.04	0.05	0.34	0.02	0.15	<0.02	<0.1	0.03	<0.02	<0.02	0.01	<0.02	<0.02
Fire House and Refueling Area	EP2011490	0958 MW104 201021	MW104 I	21/10/2020	<0.02	<0.02	0.20	<0.02	0.18	<0.02	<0.1	0.03	<0.02	<0.02	<0.01	<0.02	<0.02
Fire House and Refueling Area	EP2011490	0958 MW105 201021	MW105 D	21/10/2020	<0.02	<0.02	0.05	<0.02	0.04	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Primary Landfill	EP2011633	0958 MW106 201023	MW106 S	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Secondary Landfill	EP2011490	0958 MW109 201021	MW109 S	21/10/2020	<0.02	<0.02	0.05	<0.02	0.31	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Secondary Landfill	EP2011490	0958 MW110 201021	MW110 S	21/10/2020	<0.02	<0.02	0.03	<0.02	0.11	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Fire Equipment Testing - Former Fuel Farm	EP2011490	0958 MW112 201021	MW112 S	21/10/2020	<0.02	<0.02	0.02	<0.02	0.05	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Fire Equipment Testing - Former Fuel Farm	EP2011490	0958 MW113 201021	MW113 S	21/10/2020	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Sewage system and leach field	EP2011160	0958 MW114 201014	MW114 S	14/10/2020	<0.05	<0.05	0.25	<0.05	0.53	<0.05	<0.2	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Site Drainage - East of Runway	EP2011490	0958 MW115 201021	MW115 S	21/10/2020	<0.02	<0.02	0.04	<0.02	0.04	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011490	0958 MW116 201021	MW116 S	21/10/2020	<0.02	<0.02	0.06	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011490	0958 MW117 201021	MW117 I	21/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011490	0958 MW118 201021	MW118 D	21/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011490	0958 MW120 201021	MW120 I	21/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011490	0958 MW121 201021	MW121 D	21/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011490	0958 MW122 201021	MW122 S	21/10/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011160	0958 MW123 I 201014	MW123 I	14/10/2020	<0.02	<0.02	0.06	<0.02	0.03	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Inner Perimeter	EP2011490	0958 MW124 201021	MW124 D	21/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW125 201023	MW125 S	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW126 201023	MW126 I	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW128 201023	MW128 S	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW129 201023	MW129 I	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW130 201023	MW130 D	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW131 201023	MW131 D	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW132 201023	MW132 I	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW133 201023	MW133 D	23/10/2020	<0.02	<0.02	0.03	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW134 201023	MW134 D	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW135 201023	MW135 S	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW136 201023	MW136 I	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Off-Site Background well	EP2011633	0958 MW137 201023	MW137 S	23/10/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW138 201023	MW138 S	23/10/2020	<0.02	<0.02	0.09	<0.02	0.18	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW139 201023	MW139 I	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Site Boundary	EP2011633	0958 MW140 201023	MW140 D	23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Off-Site	EP2011633	0958 MW141 201023	MW141 S	23/10/2020	0.04	0.03	0.34	<0.02	0.08	<0.02	<0.1	0.08	<0.02	<0.02	0.02	<0.02	<0.02
Off-Site	EP2011863	0958 MW142 201029	MW142 S	29/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02
Former Fuel Farm	EP2011490	0958 MW301 201021	MW301	21/10/2020	0.42	1.49	8.16	0.29	32.3	<0.02	0.1	2.91	0.39	0.44	1.24	<0.02	<0.02
Former Fuel Farm	EP2011490	0958 MW302 201021	MW302	21/10/2020	0.16	0.31	3.02	0.79	4.02	<0.02	<0.1	0.56	0.09	0.08	0.66	<0.02	<0.02
Former Fuel Farm	EP2011490	0958 MW303 201021	MW303	21/10/2020	0.23	0.61	5.35	0.83	16.2	<0.02	<0.1	1.04	0.17	0.18	0.80	<0.02	<0.02
Fire House and Refueling Area	EP2011227	0958 MW304 201015	MW304	15/10/2020	0.61	0.45	2.79	0.21	1.81	<0.02	0.2	0.79	0.21	0.07	0.18	<0.02	<0.02
Fire House and Refueling Area	EP2011227	0958 MW305 201015	MW305	15/10/2020	0.10	0.08	1.75	0.18	2.79	<0.05	<0.2	0.18	<0.05	<0.05	0.16	<0.05	<0.05
Fire House and Refueling Area	EP2011227	0958 MW306 201015	MW306	15/10/2020	0.16	0.21	3.19	0.34	2.78	<0.02	<0.1	0.35	0.06	0.04	0.29	<0.02	<0.02
Powerhouse	EP2011227	0958 MW307 201015	MW307	15/10/2020	1.17	1.04	9.54	0.68	14.2	<0.02	0.2						

					Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluoroundecanoic acid (PFUnDA)	(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides								PFAS		
					4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EFOA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EFOAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EFOSE)	Sum of PFAS (WA DER List)_	Sum of PFHxS and PFOS	Sum of PFAS					
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L					
EQL					0.02	0.05	0.02	0.02	0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.01	0.01	0.01				
Human Health - Drinking water criteria																	0.07						
Human Health - Recreational Use criteria																	2						
Area	Lab Report Number	Field ID	Location Code	Date																			
Former Fuel Farm	EP2011490	0958 MW102 201021	MW102 D	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.57	0.49	0.64			
Fire House and Refueling Area	EP2011490	0958 MW104 201021	MW104 I	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.41	0.38	0.41			
Fire House and Refueling Area	EP2011490	0958 MW105 201021	MW105 D	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.09	0.09	0.09			
Primary Landfill	EP2011633	0958 MW106 201023	MW106 S	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Secondary Landfill	EP2011490	0958 MW109 201021	MW109 S	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.36	0.36	0.36			
Secondary Landfill	EP2011490	0958 MW110 201021	MW110 S	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.14	0.14	0.14			
Fire Equipment Testing - Former Fuel Farm	EP2011490	0958 MW112 201021	MW112 S	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.07	0.07	0.07			
Fire Equipment Testing - Former Fuel Farm	EP2011490	0958 MW113 201021	MW113 S	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.01	0.01	0.01			
Sewage system and leach field	EP2011160	0958 MW114 201014	MW114 S	14/10/2020	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.12	<0.05	0.83	0.78	0.83			
Site Drainage - East of Runway	EP2011490	0958 MW115 201021	MW115 S	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.08	0.08	0.08			
Inner Perimeter	EP2011490	0958 MW116 201021	MW116 S	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.07	0.07	0.07			
Inner Perimeter	EP2011490	0958 MW117 201021	MW117 I	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Inner Perimeter	EP2011490	0958 MW118 201021	MW118 D	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Inner Perimeter	EP2011490	0958 MW120 201021	MW120 I	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Inner Perimeter	EP2011490	0958 MW121 201021	MW121 D	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Inner Perimeter	EP2011490	0958 MW122 201021	MW122 S	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.02	0.02	0.02			
Inner Perimeter	EP2011160	0958 MW123 I 201014	MW123 I	14/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.09	0.09	0.09			
Inner Perimeter	EP2011490	0958 MW124 201021	MW124 D	21/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW125 201023	MW125 S	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW126 201023	MW126 I	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW128 201023	MW128 S	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW129 201023	MW129 I	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW130 201023	MW130 D	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW131 201023	MW131 D	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW132 201023	MW132 I	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW133 201023	MW133 D	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.03	0.03	0.03			
Site Boundary	EP2011633	0958 MW134 201023	MW134 D	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW135 201023	MW135 S	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW136 201023	MW136 I	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Off-Site Background well	EP2011633	0958 MW137 201023	MW137 S	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.02	0.02	0.02			
Site Boundary	EP2011633	0958 MW138 201023	MW138 S	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.27	0.27	0.27			
Site Boundary	EP2011633	0958 MW139 201023	MW139 I	23/10/2020	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Site Boundary	EP2011633	0958 MW140 201023	MW140 D	23/10/2020	<0.02	<0.05	<0.0																

					Inorganics															Organic	
					Carbonate Alkalinity (as CaCO ₃)	Alkalinity (Bicarbonate as CaCO ₃)	Alkalinity (Hydroxide) as CaCO ₃	Alkalinity (total) as CaCO ₃	Anions Total	Cations Total	Calcium (filtered)	Chloride	Ionic Balance	Magnesium (filtered)	pH (Lab)	Potassium (filtered)	Sodium (filtered)	Sulphate as SO ₄ - Turbidimetric (filtered)	TDS	Total Suspended Solids	Dissolved Organic Carbon
EQL					1	1	1	1	0.01	0.01	1	1	0.01	1	0.01	1	1	1	10	5	1
Human Health - Drinking water criteria																					
Human Health - Recreational Use criteria																					
Area	Lab Report Number	Field ID	Location Code	Date																	
Former Fuel Farm	EP2011490	0958_MW102_201021	MW102_D	21/10/2020	<1	10	<1	10	0.65	0.73	<1	16	-	1	6.10	<1	15	<1	90	<5	21
Fire House and Refueling Area	EP2011490	0958_MW104_201021	MW104_I	21/10/2020	<1	88	<1	88	3.03	2.88	32	43	2.56	2	7.47	3	24	3	194	78	7
Fire House and Refueling Area	EP2011490	0958_MW105_201021	MW105_D	21/10/2020	<1	16	<1	16	0.86	1.03	2	19	-	1	6.28	1	19	<2	116	6	27
Primary Landfill	EP2011633	0958_MW106_201023	MW106_S	23/10/2020	<1	<1	<1	<1	1.24	0.99	<1	30	-	3	3.39	<1	17	19	220	410	66
Secondary Landfill	EP2011490	0958_MW109_201021	MW109_S	21/10/2020	<1	<1	<1	<1	1.08	1.01	4	16	-	4	4.36	<1	11	30	154	156	31
Secondary Landfill	EP2011490	0958_MW110_201021	MW110_S	21/10/2020	<1	<1	<1	<1	0.76	0.88	3	21	-	3	4.56	<1	11	8	194	98	33
Fire Equipment Testing - Former Fuel Farm	EP2011490	0958_MW112_201021	MW112_S	21/10/2020	<1	<1	<1	<1	0.48	0.69	6	17	-	<1	3.95	<1	9	<2	125	167	26
Fire Equipment Testing - Former Fuel Farm	EP2011490	0958_MW113_201021	MW113_S	21/10/2020	<1	<1	<1	<1	0.82	0.89	4	29	-	1	3.91	<1	14	<2	142	61	31
Sewage system and leach field	EP2011160	0958_MW114_201014	MW114_S	14/10/2020	<1	22	<1	22	1.41	1.72	11	33	-	2	6.76	2	22	2	154	4,300	12
Site Drainage - East of Runway	EP2011490	0958_MW115_201021	MW115_S	21/10/2020	<1	<1	<1	<1	0.59	0.82	6	21	-	1	3.84	<1	10	<2	148	305	42
Inner Perimeter	EP2011490	0958_MW116_201021	MW116_S	21/10/2020	<1	<1	<1	<1	0.70	1.10	4	25	-	3	4.18	<1	15	<2	142	283	40
Inner Perimeter	EP2011490	0958_MW117_201021	MW117_I	21/10/2020	<1	12	<1	12	0.94	0.99	<1	25	-	2	6.23	<1	19	<1	56	<10	16
Inner Perimeter	EP2011490	0958_MW118_201021	MW118_D	21/10/2020	<1	23	<1	23	1.98	1.70	2	54	-	3	6.27	2	30	<1	114	18	12
Inner Perimeter	EP2011490	0958_MW120_201021	MW120_I	21/10/2020	<1	2	<1	2	0.57	0.72	5	13	-	2	5.28	<1	7	8	101	148	23
Inner Perimeter	EP2011490	0958_MW121_201021	MW121_D	21/10/2020	<1	50	<1	50	2.41	2.11	10	50	-	2	6.58	2	32	<1	192	41	15
Inner Perimeter	EP2011490	0958_MW122_201021	MW122_S	21/10/2020	<1	<1	<1	<1	0.73	1.02	4	26	-	2	4.30	<1	15	<2	151	665	34
Inner Perimeter	EP2011160	0958_MW123_I_201014	MW123_I	14/10/2020	<1	10	<1	10	1.51	1.68	4	36	-	5	6.14	1	24	14	156	<5	25
Inner Perimeter	EP2011490	0958_MW124_201021	MW124_D	21/10/2020	<1	10	<1	10	1.69	1.53	1	52	-	2	5.82	4	28	1	994	1,990	10
Site Boundary	EP2011633	0958_MW125_201023	MW125_S	23/10/2020	<1	7	<1	7	0.79	0.86	<1	18	3.79	3	6.37	<1	14	7	121	108	16
Site Boundary	EP2011633	0958_MW126_201023	MW126_I	23/10/2020	<1	18	<1	18	1.60	1.54	<1	44	1.88	3	6.56	3	28	<1	105	11	6
Site Boundary	EP2011633	0958_MW128_201023	MW128_S	23/10/2020	<1	7	<1	7	1.51	1.62	<1	42	3.48	3	6.00	1	31	9	127	179	14
Site Boundary	EP2011633	0958_MW129_201023	MW129_I	23/10/2020	<1	8	<1	8	1.65	1.56	<1	53	2.97	3	6.10	2	29	<1	144	163	9
Site Boundary	EP2011633	0958_MW130_201023	MW130_D	23/10/2020	<1	26	<1	26	1.78	1.90	8	44	3.35	3	6.70	5	26	1	134	83	7
Site Boundary	EP2011633	0958_MW131_201023	MW131_D	23/10/2020	<1	29	<1	29	1.29	1.30	<1	23	0.19	2	6.40	<1	26	3	90	153	15
Site Boundary	EP2011633	0958_MW132_201023	MW132_I	23/10/2020	<1	27	<1	27	1.78	1.82	4	44	1.19	4	6.66	3	28	<1	106	28	9
Site Boundary	EP2011633	0958_MW133_201023	MW133_D	23/10/2020	<1	9	<1	9	0.88	0.91	<1	25	1.32	1	6.27	<1	19	<1	69	101	13
Site Boundary	EP2011633	0958_MW134_201023	MW134_D	23/10/2020	<1	13	<1	13	1.50	1.64	2	44	4.47	3	6.54	3	28	<1	102	14	10
Site Boundary	EP2011633	0958_MW135_201023	MW135_S	23/10/2020	<1	11	<1	11	1.62	1.71	1	40	2.73	4	6.28	1	30	13	113	217	9
Site Boundary	EP2011633	0958_MW136_201023	MW136_I	23/10/2020	<1	10	<1	10	1.38	1.62	2	42	-	3	6.43	2	28	<1	102	16	9
Off-Site Background well	EP2011633	0958_MW137_201023	MW137_S	23/10/2020	<1	<1	<1	<1	0.96	1.88	8	20	-	6	4.57	15	14	19	194	430	31
Site Boundary	EP2011633	0958_MW138_201023	MW138_S	23/10/2020	<1	<1	<1	<1	3.07	3.06	3	77	0.12	8	4.27	3	50	43	312	65	76
Site Boundary	EP2011633	0958_MW139_201023	MW139_I	23/10/2020	<1	15	<1	15	1.79	1.52	<1	52	-	3	6.30	2	28	1	103	43	6
Site Boundary	EP2011633	0958_MW140_201023	MW140_D	23/10/2020	<1	171	<1	171	4.52	4.69	66	39	1.84	3	7.93	4	24	<1	254	18	7
Off-Site	EP2011633	0958_MW141_201023	MW141_S	23/10/2020	<1	<1	<1	<1	1.62	1.58	<1	53	1.33	3	5.20	1	30	6	126	36	13
Off-Site	EP2011863	0958_MW142_201029	MW142_S	29/10/2020	<1	<1	<1	<1	2.05	2.21	1	63	3.78	5	4.36	2	39	13	230	80	43
Former Fuel Farm	EP2011490	0958_MW301_201021	MW301	21/10/2020	<1	<1	<1	<1	0.54	1.01	9	19	-	1	3.64	<1	11	<2	158	112	30
Former Fuel Farm	EP2011490	0958_MW302_201021	MW302	21/10/2020	<1	<1	<1	<1	0.45	0.79	8	16	-	<1	4.08	<1	9	<2	134	186	19
Former Fuel Farm	EP2011490	0958_MW303_201021	MW303	21/10/2020	<1	<1	<1	<1	0.54	0.86	6	19	-	1	3.95	<1	11	<2	114	72	18
Fire House and Refueling Area	EP2011227	0958_MW304_201015	MW304	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
Fire House and Refueling Area	EP2011227	0958_MW305_201015	MW305	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
Fire House and Refueling Area	EP2011227	0958_MW306_201015	MW306	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18
Powerhouse	EP2011227	0958_MW307_201015	MW307	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
Powerhouse	EP2011227	0958_MW308_201015	MW308	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11
Powerhouse	EP2011227	0958_MW309_201015	MW309	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	17
Powerhouse	EP2011227	0958_MW310_201015	MW310	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
Fire Equipment Testing - Former Fuel Farm	EP2011490	0958_MW312_201021	MW312	21/10/2020	<1	8	<1	8	0.98	1.48	8	29	-	2	6.12	2	20	<2	146	32	24
Fire Equipment Testing - Former Fuel Farm	EP2011227	0958_MW313_201015	MW313	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23
Base Water Supply Infrastructure	EP2011227	0958_MW401_201015	MW401	15/10/2020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Base Water Supply Infrastructure	EP2011863	0958_MW402_201029	MW402	29/10/2020	<1	91	<1	91	5.89	5.11	4	143	7.08	<1	7.80	<1	113	2	322	<5	5
Off-Site	EP2011863	0958_MW403_201029	MW403	29/10/2020	<1	2	<1	2	2.92	3.17	2	86	4.00	6	5.93	2	58	22	179	21	2
Fire House and Refueling Area	EP2011490	0958_MW103_201021	MW504	21/10/2020	<1	16	<1	16	1.01	1.12	9	18	-	2	6.33	1	11	9	196	356	14
Base Water Supply Infrastructure	EP2011490	0958_MW311_201021	MW505	21/10/2020	<1	9	<1	9	0.95	1.23	7	22	-	1	6.26	4	16	7	124	260	20
Leach Fied Hut (Outdoor)	EP2011160	0958_POT101_201014	POT101	14/10/2020	<1	102	<1	102	5.52	4.10	5	121	14.7	<1	7.89	1	88	3	294	<5	6
Air Traffic Control Tower (Outdoor)	EP2011490	0958_POT102_201021	POT102	21/10/2020	<1	82	<1	82	5.57	5.11	26	138	4.34	5	7.60	2	77	2	294	<5	6
Crew Huts Kitchenette (Indoor)	EP2011160	0958_POT103_201014	POT103	14/10/2020	<1	68	<1	68	5.04	4.64	9	129	4.11	2	7.46	1	92	2	296	<5	4
Fire House Kitchenette (Indoor)	EP2011160	0958_POT104_201014	POT104	14/10/2020	<1	49	<1	49	4.92	4.83	19	139	0.97	4	7.19	1	81	1	286	<5	6
Former Pearce Flying Club (Outdoor)	EP2011160	0958_POT105_201014	POT105	14/10/2020	<1	76	<1	76	5.17	4.24	6	128	9.90	1	7.49	1	88	2	289	<5	7

Notes: First time detect of PFOA or PFOS+PFHxS

New Exceedance of guideline value

	Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids												(n:2) Fluorotelom	
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05

Lab Report Number	Field ID	Date	Sample Type																			
EP2011160	0958_QC301_201014	14/10/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011160	0958_QC401_201014	14/10/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011227	0958_QC301_201015	15/10/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011227	0958_QC401_201015	15/10/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011490	0958_QC301_201021	21/10/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011490	0958_QC401_201021	21/10/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011633	0958_QC301_201023	23/10/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011633	0958_QC401_201023	23/10/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011863	0958_QC301_201029	29/10/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
EP2011863	0958_QC401_201029	29/10/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05

Table 2: Rinsate Field Blank samples

EQ	er Sulfonic Acids		Perfluoroalkyl Sulfonamides								PFAS		
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01	

Lab Report Number	Field ID	Date	Sample Type												
EP2011160	0958_QC301_201014	14/10/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011160	0958_QC401_201014	14/10/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011227	0958_QC301_201015	15/10/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011227	0958_QC401_201015	15/10/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011490	0958_QC301_201021	21/10/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011490	0958_QC401_201021	21/10/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011633	0958_QC301_201023	23/10/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011633	0958_QC401_201023	23/10/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011863	0958_QC301_201029	29/10/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011863	0958_QC401_201029	29/10/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Lab Report Number			EP2011160			EP2011160			751043			EP2011160			751043			EP2011227			EP2011227			751054			EP2011227			751054		
Field ID			0958 POT104_201014			0958 QC102_201014			0958 MW123_1_201014			0958 QC103_201015			0958 MW306_201015			0958 QC203_201015			0958 MW313_201015			0958 QC104_201015			0958 MW313_201015			0958 QC204_201015		
Date			14/10/2020			14/10/2020			14/10/2020			14/10/2020			15/10/2020			15/10/2020			15/10/2020			15/10/2020			15/10/2020			15/10/2020		
Matrix Type			Water			Water			Water			Water			Water			Water			Water			Water			Water			Water		
RPD			RPD			RPD			RPD			RPD			RPD			RPD			RPD			RPD			RPD			RPD		
	Unit	EQL																														
Perfluoroalkane Sulfonic Acids																																
Perfluoropropanesulfonic acid (PFPS)	µg/L	0.01	-	-	-	-	0.04	-	-	-	-	<0.01	-	-	-	-	-	0.03	-	-	-	-	-	-	<0.01	-	-					
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.08	0.08	0	0.08	0.07	13	<0.02	<0.02	0	<0.02	<0.01	0	0.16	0.14	13	0.16	0.14	13	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.07	0.07	0	0.07	0.07	0	<0.02	<0.02	0	<0.02	<0.01	0	0.21	0.20	5	0.21	0.20	5	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.63	0.63	0	0.63	0.48	27	0.06	0.06	0	0.06	0.04	40	3.19	2.98	7	3.19	3.4	6	0.09	0.09	0	0.09	0.12	29	-					
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.04	0.04	0	0.04	0.03	29	<0.02	<0.02	0	<0.02	<0.01	0	0.34	0.34	0	0.34	0.32	6	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.24	0.26	8	0.24	0.27	12	0.03	0.03	0	0.03	0.03	0	2.78	2.86	3	2.78	3.2	14	0.04	0.03	29	0.04	0.04	0	-					
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-	-						
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluoroalkane Carboxylic Acids																																
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0	-					
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.16	0.15	6	0.16	0.10	46	<0.02	<0.02	0	<0.02	<0.01	0	0.35	0.31	12	0.35	0.27	26	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.02	0.02	0	0.02	0.02	0	<0.02	<0.02	0	<0.02	<0.01	0	0.06	0.06	0	0.06	0.07	15	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	0.04	0.04	0	0.04	0.04	0	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.03	0.03	0	0.03	0.02	40	<0.01	<0.01	0	<0.01	<0.01	0	0.29	0.26	11	0.29	0.26	11	<0.01	<0.01	0	<0.01	<0.01	0	-					
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	-					
Perfluorotridecanoic acid (PFTriDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	-					
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	-					
(n-2) Fluorotelomer Sulfonic Acids																																
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	-					
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	-					
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	-					
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	-					
Perfluoroalkyl Sulfonamides																																
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	-					
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	-					
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	-					
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	-					
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	-					
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	-					
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	-					
PFAS																																
Sum of PFAS (WA DER List)	µg/L	0.01	1.16	1.17	1	1.16	0.97	18	0.09	0.09	0	0.09	0.07	25	6.87	6.65	3	6.87	7.38	7	0.13	0.12	8	0.13	0.16	21	-					
Sum of PFHxS and PFOS	µg/L	0.01																														

APPENDIX

C

LABORATORY CERTIFICATES



ALS Compass

SAMPLING *Intelligence*



Environmental Division
Perth

Work Order Reference
EP2011160



Telephone : + 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEF19009 Client: CAKANO Project Manager: _____

Phone: _____

ALS Compass COC Reference: 14887 # Samples: _____

14910, 14908, 14883

Sampler: _____

Phone: _____

Turnaround Requirements: Standard Urgent _____

Special Instructions:

please read QC201, QC202, QC203 + QC204 to Europius.

Custody: _____

Relinquished by: _____ Received by: _____

Relinquished by: _____

Received by: _____

Date / Time: _____ Date / Time: _____

Date / Time: _____

Date / Time: _____

14/10/20

14/10/20 1644

**CHAIN OF CUSTODY**

COC#: 14898 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: MB-DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinse WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW114		14/10/2020 10:51 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_POT104		14/10/2020 10:53 AM	Water	ALS: 6 Non ALS: 0	No	X			extra PFAS bottles for lab QC
003	0958_QC102		14/10/2020 10:55 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_MW123_I		14/10/2020 10:57 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_QC101		14/10/2020 10:58 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0958_POT103		14/10/2020 11:00 AM	Water	ALS: 4 Non ALS: 0	No	X			
007	0958_POT101		14/10/2020 11:50 AM	Water	ALS: 4 Non ALS: 0	No	X			
008	0958_POT105		14/10/2020 11:51 AM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_QC301		14/10/2020 01:00 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

COC#: 14898

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: MB-DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinse WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_QC401		14/10/2020 01:01 PM	Water	ALS: 2 Non ALS: 0	No		X		



ALS Laboratory: EP Perth

RECEIVED BY:

DATE TIME:

EMAIL INVOICES TO:

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

c

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW114	HDPE (no PTFE)	20 mL	00352005006773	Grey	No	
001	0958_MW114	Clear Plastic Bottle - Natural	250 mL	00070719062283	Green	No	
001	0958_MW114	HDPE (no PTFE)	20 mL	00352005007504	Grey	No	
001	0958_MW114	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023813	Purple	No	
002	0958_POT104	Clear Plastic Bottle - Natural	250 mL	00070719062547	Green	No	
002	0958_POT104	HDPE (no PTFE)	20 mL	00352005006333	Grey	No	
002	0958_POT104	HDPE (no PTFE)	20 mL	00352005006316	Grey	No	
002	0958_POT104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058034	Purple	No	
002	0958_POT104	HDPE (no PTFE)	20 mL	00352005020581	Grey	No	
002	0958_POT104	HDPE (no PTFE)	20 mL	00352005020580	Grey	No	
003	0958_QC102	HDPE (no PTFE)	20 mL	00352005005144	Grey	No	
003	0958_QC102	Clear Plastic Bottle - Natural	250 mL	00070719062542	Green	No	
003	0958_QC102	HDPE (no PTFE)	20 mL	00352005006463	Grey	No	
003	0958_QC102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057905	Purple	No	
004	0958_MW123_I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057992	Purple	No	
004	0958_MW123_I	HDPE (no PTFE)	20 mL	00352005006360	Grey	No	
004	0958_MW123_I	HDPE (no PTFE)	20 mL	00352005006478	Grey	No	
004	0958_MW123_I	Clear Plastic Bottle - Natural	250 mL	00070719062369	Green	No	
005	0958_QC101	HDPE (no PTFE)	20 mL	00352005006830	Grey	No	
005	0958_QC101	HDPE (no PTFE)	20 mL	00352005006603	Grey	No	
005	0958_QC101	Clear Plastic Bottle - Natural	250 mL	00070719062228	Green	No	
005	0958_QC101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023918	Purple	No	
006	0958_POT103	Clear Plastic Bottle - Natural	250 mL	00070719062364	Green	No	
006	0958_POT103	HDPE (no PTFE)	20 mL	00352005006317	Grey	No	
006	0958_POT103	HDPE (no PTFE)	20 mL	00352005006432	Grey	No	
006	0958_POT103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058092	Purple	No	

**CHAIN OF CUSTODY**

COC#: 14898

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: MB-DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

007	0958_POT101	Clear Plastic Bottle - Natural	250 mL	00070719062457	Green	No	
007	0958_POT101	HDPE (no PTFE)	20 mL	00352005006628	Grey	No	
007	0958_POT101	HDPE (no PTFE)	20 mL	00352005002560	Grey	No	
007	0958_POT101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023609	Purple	No	
008	0958_POT105	Clear Plastic Bottle - Natural	250 mL	00070719062312	Green	No	
008	0958_POT105	HDPE (no PTFE)	20 mL	00352005006762	Grey	No	
008	0958_POT105	HDPE (no PTFE)	20 mL	00352005002606	Grey	No	
008	0958_POT105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023863	Purple	No	
009	0958_QC301	HDPE (no PTFE)	20 mL	00352005020436	Grey	No	
009	0958_QC301	HDPE (no PTFE)	20 mL	00352005020465	Grey	No	
010	0958_QC401	HDPE (no PTFE)	20 mL	00352005020605	Grey	No	
010	0958_QC401	HDPE (no PTFE)	20 mL	00352005020499	Grey	No	

Total Bottle Count: ALS: 38, Non ALS: 0

CERTIFICATE OF ANALYSIS

Work Order : EP2011160 Amendment : 1 Client : CARDNO (WA) PTY LTD Contact : [REDACTED] Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006 Telephone : ---- Project : WA_0958_PFASOMP Order number : DEF19009/330 C-O-C number : 14898 Sampler : [REDACTED] Site : DEF19009/Gingin Quote number : SY/139/19 No. of samples received : 12 No. of samples analysed : 12	Page : 1 of 11 Laboratory : Environmental Division Perth Contact : [REDACTED] Address : 26 Rigali Way Wangara WA Australia 6065 Telephone : [REDACTED] Date Samples Received : 14-Oct-2020 16:44 Date Analysis Commenced : 16-Oct-2020 Issue Date : 27-Oct-2020 13:51
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This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high for sample #1, 4, 5 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits for sample #11 and 12 due to analytes not quantified in this report. Major cations (ED093F) have been confirmed by re-analysis.
- EP231X: Sample EP2011160_001 required dilution prior to extraction due to matrix interferences (High sediment content). LOR values have been adjusted accordingly.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW114_201014	0958_POT104_201014	0958_QC102_201014	0958_MW123_I_201014	0958_QC101_201014
Client sampling date / time				14-Oct-2020 10:51	14-Oct-2020 10:53	14-Oct-2020 10:55	14-Oct-2020 10:57	14-Oct-2020 10:58
Compound	CAS Number	LOR	Unit	EP2011160-001	EP2011160-002	EP2011160-003	EP2011160-004	EP2011160-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.76	7.19	7.24	6.14	6.05
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	154	286	287	156	163
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	4300	<5	<5	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	22	49	52	10	9
Total Alkalinity as CaCO3	----	1	mg/L	22	49	52	10	9
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	1	1	14	15
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	33	139	140	36	36
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	11	19	19	4	4
Magnesium	7439-95-4	1	mg/L	2	4	4	5	4
Sodium	7440-23-5	1	mg/L	22	81	82	24	24
Potassium	7440-09-7	1	mg/L	2	1	1	1	1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.41	4.92	5.01	1.51	1.51
∅ Total Cations	----	0.01	meq/L	1.72	4.83	4.87	1.68	1.60
∅ Ionic Balance	----	0.01	%	----	0.97	1.41	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	12	6	6	25	26
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.05	0.08	0.08	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.05	0.07	0.07	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.25	0.63	0.63	0.06	0.06
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.05	0.04	0.04	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW114_201014	0958_POT104_201014 4	0958_QC102_201014	0958_MW123_I_2010 14	0958_QC101_201014
Client sampling date / time				14-Oct-2020 10:51	14-Oct-2020 10:53	14-Oct-2020 10:55	14-Oct-2020 10:57	14-Oct-2020 10:58
Compound	CAS Number	LOR	Unit	EP2011160-001	EP2011160-002	EP2011160-003	EP2011160-004	EP2011160-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.53	0.24	0.26	0.03	0.03
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.2	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.05	0.02	0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.05	0.16	0.15	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.05	0.03	0.03	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.12	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.12	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.12	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.12	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.12	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW114_201014	0958_POT104_201014 4	0958_QC102_201014	0958_MW123_I_2010 14	0958_QC101_201014
Client sampling date / time				14-Oct-2020 10:51	14-Oct-2020 10:53	14-Oct-2020 10:55	14-Oct-2020 10:57	14-Oct-2020 10:58
Compound	CAS Number	LOR	Unit	EP2011160-001	EP2011160-002	EP2011160-003	EP2011160-004	EP2011160-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.05	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.83	1.27	1.28	0.09	0.09
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.78	0.87	0.89	0.09	0.09
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.83	1.16	1.17	0.09	0.09
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	98.7	93.0	88.4	88.0	89.0
13C8-PFOA	----	0.02	%	94.9	100	103	103	100



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_POT103_20101 4	0958_POT101_20101 4	0958_POT105_20101 4	0958_POT101_20101 4	0958_POT105_20101 4
Client sampling date / time				14-Oct-2020 11:00	14-Oct-2020 11:50	14-Oct-2020 11:51	21-Oct-2020 11:50	21-Oct-2020 11:50
Compound	CAS Number	LOR	Unit	EP2011160-006	EP2011160-007	EP2011160-008	EP2011160-011	EP2011160-012
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.46	----	----	7.89	7.49
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	296	----	----	294	289
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	68	----	----	102	76
Total Alkalinity as CaCO3	----	1	mg/L	68	----	----	102	76
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	----	----	3	2
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	129	----	----	121	128
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	9	5	4	5	6
Magnesium	7439-95-4	1	mg/L	2	<1	<1	<1	1
Sodium	7440-23-5	1	mg/L	92	93	88	88	88
Potassium	7440-09-7	1	mg/L	1	1	<1	1	1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	----	----	----	5.52	5.17
∅ Total Anions	----	0.01	meq/L	5.04	----	----	----	----
∅ Total Cations	----	0.01	meq/L	4.64	----	----	4.10	4.24
∅ Ionic Balance	----	0.01	%	----	----	----	14.7	9.90
∅ Ionic Balance	----	0.01	%	4.11	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	4	6	7	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.05	0.06	0.07	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.04	0.04	0.06	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.36	0.42	0.53	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_POT103_20101 4	0958_POT101_20101 4	0958_POT105_20101 4	0958_POT101_20101 4	0958_POT105_20101 4
Client sampling date / time				14-Oct-2020 11:00	14-Oct-2020 11:50	14-Oct-2020 11:51	21-Oct-2020 11:50	21-Oct-2020 11:50
Compound	CAS Number	LOR	Unit	EP2011160-006	EP2011160-007	EP2011160-008	EP2011160-011	EP2011160-012
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.02	0.03	0.04	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.14	0.18	0.23	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.09	0.11	0.12	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.02	0.02	0.02	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_POT103_20101 4	0958_POT101_20101 4	0958_POT105_20101 4	0958_POT101_20101 4	0958_POT105_20101 4
Client sampling date / time				14-Oct-2020 11:00	14-Oct-2020 11:50	14-Oct-2020 11:51	21-Oct-2020 11:50	21-Oct-2020 11:50
Compound	CAS Number	LOR	Unit	EP2011160-006	EP2011160-007	EP2011160-008	EP2011160-011	EP2011160-012
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.72	0.86	1.07	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.50	0.60	0.76	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.66	0.79	0.97	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	94.3	86.1	90.1	----	----
13C8-PFOA	----	0.02	%	102	96.6	103	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				0958_QC301_201014	0958_QC401_201014	----	----	----
Client sampling date / time				14-Oct-2020 13:00	14-Oct-2020 13:01	----	----	----
Compound	CAS Number	LOR	Unit	EP2011160-009	EP2011160-010	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	0958_QC301_201014	0958_QC401_201014	----	----	----
Client sampling date / time					14-Oct-2020 13:00	14-Oct-2020 13:01	----	----	----
Compound	CAS Number	LOR	Unit		EP2011160-009	EP2011160-010	-----	-----	-----
				Result	Result		----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05		----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05		----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02		----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02		----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05		----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05		----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05		----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05		----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01		----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01		----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01		----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	94.1	93.4		----	----	----
13C8-PFOA	----	0.02	%	102	102		----	----	----



Surrogate Control Limits

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

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

QUALITY CONTROL REPORT

Work Order	: EP2011160	Page	: 1 of 9
Amendment	: 1		
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 14-Oct-2020
Order number	: DEF19009/330	Date Analysis Commenced	: 16-Oct-2020
C-O-C number	: 14898	Issue Date	: 27-Oct-2020
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3321010)									
EP2011141-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.68	7.67	0.130	0% - 20%
EP2011176-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.44	7.45	0.134	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3323179)									
EP2011288-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.90	7.95	0.631	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3320141)									
EP2011160-001	0958_MW114_201014	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	154	153	0.651	0% - 50%
EP2011175-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6390	6120	4.35	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3328193)									
EP2011160-011	0958_POT101_201014	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	294	306	3.99	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3320142)									
EP2011160-001	0958_MW114_201014	EA025H: Suspended Solids (SS)	----	5	mg/L	4300	4640	7.57	0% - 20%
EP2011175-008	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	786	772	1.86	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3328194)									
EP2011160-011	0958_POT101_201014	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3321011)									
EP2011141-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	13	13	0.00	0% - 50%
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	13	13	0.00	0% - 50%
EP2011176-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	316	315	0.463	0% - 20%
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	316	315	0.463	0% - 20%



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3323178)									
EP2011288-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	204	202	1.10	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	204	202	1.10	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3311007)									
EP2011160-001	0958_MW114_201014	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	1	0.00	No Limit
EP2011175-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	10	10	0.00	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3328723)									
EP2011160-011	0958_POT101_201014	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3	3	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3311008)									
EP2011160-001	0958_MW114_201014	ED045G: Chloride	16887-00-6	1	mg/L	33	33	0.00	0% - 20%
EP2011175-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	273	273	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3328724)									
EP2011160-011	0958_POT101_201014	ED045G: Chloride	16887-00-6	1	mg/L	121	114	5.71	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3312368)									
EP2011160-001	0958_MW114_201014	ED093F: Calcium	7440-70-2	1	mg/L	11	10	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	22	22	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EP2011219-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	41	41	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	34	34	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	276	280	1.55	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	29	29	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3322984)									
EP2011428-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	23	24	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	94	95	1.44	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	32	32	0.00	0% - 20%
EP2011441-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	323	328	1.57	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	814	824	1.28	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5920	6010	1.54	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	333	339	1.94	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3319187)									
EP2011086-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	6	5	0.00	No Limit
EP2011166-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	5	33.1	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3316410)									
EP2011160-002	0958_POT104_201014	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.24	0.27	10.3	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.08	0.08	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	0.07	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3316410) - continued									
EP2011160-002	0958_POT104_201014	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.63	0.64	1.75	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP2011160-001	0958_MW114_201014	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.53	0.55	3.70	0% - 50%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.25	0.24	4.08	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.05	<0.05	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3316410)									
EP2011160-002	0958_POT104_201014	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.02	0.03	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.16	0.15	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP2011160-001	0958_MW114_201014	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.05	0.05	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.2	<0.2	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3316410)									
EP2011160-002	0958_POT104_201014	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3316410) - continued									
EP2011160-002	0958_POT104_201014	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2011160-001	0958_MW114_201014	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.12	<0.12	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3316410)									
EP2011160-002	0958_POT104_201014	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2011160-001	0958_MW114_201014	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3316410)									
EP2011160-002	0958_POT104_201014	EP231X: Sum of PFAS	----	0.01	µg/L	1.27	1.31	3.10	0% - 20%
EP2011160-001	0958_MW114_201014	EP231X: Sum of PFAS	----	0.01	µg/L	0.83	0.84	1.20	0% - 50%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3321010)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3323179)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3320141)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	102	88.1	114
				<10	1000 mg/L	105	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3328193)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	100	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3320142)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	110	89.1	120
				<5	1000 mg/L	100	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3328194)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	104	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3321011)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	108	81.2	126
				<1	200 mg/L	101	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3323178)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	107	81.2	126
				<1	200 mg/L	97.4	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3311007)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	99.0	87.7	113
				<1	500 mg/L	107	87.7	113



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3328723)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	106	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3311008)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	87.9	114
				<1	1000 mg/L	101	87.9	114
ED045G: Chloride by Discrete Analyser (QCLot: 3328724)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	87.9	114
				<1	1000 mg/L	98.7	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3312368)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	108	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	101	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3322984)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.6	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.6	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	94.6	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.3	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3319187)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	103	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3316410)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	92.2	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	96.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	103	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	120	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	114	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3316410)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	102	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	121	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	90.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	98.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	98.4	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	114	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	93.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	98.0	72.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3316410) - continued								
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	102	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	79.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3316410)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	89.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	77.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	106	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	80.3	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	93.9	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	94.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	93.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3316410)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	117	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	90.2	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	86.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	84.4	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number			Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3311007)							
EP2011160-001	0958_MW114_201014	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	130	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3328723)							
EP2011160-011	0958_POT101_201014	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	112	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3311008)							
EP2011160-001	0958_MW114_201014	ED045G: Chloride	16887-00-6	1000 mg/L	105	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3328724)							
EP2011160-011	0958_POT101_201014	ED045G: Chloride	16887-00-6	1000 mg/L	104	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3319187)							
EP2011160-001	0958_MW114_201014	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3316410)							
EP2011160-001	0958_MW114_201014	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	116	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	93.0	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	92.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	97.4	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	114	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	109	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3316410)							
EP2011160-001	0958_MW114_201014	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	103	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	121	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	105	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	101	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	117	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	94.6	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	121	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	106	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	107	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	81.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3316410)							
EP2011160-001	0958_MW114_201014	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	93.4	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	77.4	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	98.8	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	75.1	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	98.6	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	94.6	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	91.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3316410)							
EP2011160-001	0958_MW114_201014	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	118	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	87.0	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	84.0	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order : EP2011160

Page : 1 of 7

Amendment : 1

Client : CARDNO (WA) PTY LTD

Laboratory : Environmental Division Perth

Contact : [REDACTED]

Telephone : [REDACTED]

Project : WA_0958_PFASOMP

Date Samples Received : 14-Oct-2020

Site : DEF19009/Gingin

Issue Date : 27-Oct-2020

Sampler : [REDACTED]

No. of samples received : 12

Order number : DEF19009/330

No. of samples analysed : 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW114_201014,	0958_POT104_201014,	----	----	----	21-Oct-2020	14-Oct-2020	7
0958_QC102_201014,	0958_MW123_I_201014,						
0958_QC101_201014,	0958_POT103_201014						
Clear Plastic Bottle - Natural							
0958_POT101_201014,	0958_POT105_201014	----	----	----	22-Oct-2020	21-Oct-2020	1

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)		14-Oct-2020	----	----	----	21-Oct-2020	14-Oct-2020	✘
0958_MW114_201014, 0958_POT104_201014,								
0958_QC102_201014, 0958_MW123_I_201014,								
0958_QC101_201014, 0958_POT103_201014								
Clear Plastic Bottle - Natural (EA005-P)		21-Oct-2020	----	----	----	22-Oct-2020	21-Oct-2020	✘
0958_POT101_201014, 0958_POT105_201014								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)		14-Oct-2020	----	----	----	21-Oct-2020	21-Oct-2020	✔
0958_MW114_201014, 0958_POT104_201014,								
0958_QC102_201014, 0958_MW123_I_201014,								
0958_QC101_201014, 0958_POT103_201014								
Clear Plastic Bottle - Natural (EA015H)		21-Oct-2020	----	----	----	26-Oct-2020	28-Oct-2020	✔
0958_POT101_201014, 0958_POT105_201014								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		14-Oct-2020	----	----	----	21-Oct-2020	21-Oct-2020	✓
0958_MW114_201014,	0958_POT104_201014,							
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014							
Clear Plastic Bottle - Natural (EA025H)		21-Oct-2020	----	----	----	26-Oct-2020	28-Oct-2020	✓
0958_POT101_201014,	0958_POT105_201014							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		14-Oct-2020	----	----	----	21-Oct-2020	28-Oct-2020	✓
0958_MW114_201014,	0958_POT104_201014,							
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014							
Clear Plastic Bottle - Natural (ED037-P)		21-Oct-2020	----	----	----	22-Oct-2020	04-Nov-2020	✓
0958_POT101_201014,	0958_POT105_201014							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		14-Oct-2020	----	----	----	23-Oct-2020	11-Nov-2020	✓
0958_MW114_201014,	0958_POT104_201014,							
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014							
Clear Plastic Bottle - Natural (ED041G)		21-Oct-2020	----	----	----	26-Oct-2020	18-Nov-2020	✓
0958_POT101_201014,	0958_POT105_201014							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		14-Oct-2020	----	----	----	23-Oct-2020	11-Nov-2020	✓
0958_MW114_201014,	0958_POT104_201014,							
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014							
Clear Plastic Bottle - Natural (ED045G)		21-Oct-2020	----	----	----	26-Oct-2020	18-Nov-2020	✓
0958_POT101_201014,	0958_POT105_201014							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		14-Oct-2020	----	----	----	16-Oct-2020	21-Oct-2020	✓
0958_MW114_201014,	0958_POT104_201014,							
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014,							
0958_POT101_201014,	0958_POT105_201014							
Clear Plastic Bottle - Natural (ED093F)		21-Oct-2020	----	----	----	22-Oct-2020	28-Oct-2020	✓
0958_POT101_201014,	0958_POT105_201014							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		14-Oct-2020	----	----	----	20-Oct-2020	11-Nov-2020	✓
0958_MW114_201014,	0958_POT104_201014,							
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014,							
0958_POT101_201014,	0958_POT105_201014							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0958_MW114_201014,	0958_POT104_201014,	14-Oct-2020	19-Oct-2020	12-Apr-2021	✔	20-Oct-2020	12-Apr-2021	✔
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014,							
0958_POT101_201014,	0958_POT105_201014,							
0958_QC301_201014,	0958_QC401_201014							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0958_MW114_201014,	0958_POT104_201014,	14-Oct-2020	19-Oct-2020	12-Apr-2021	✔	20-Oct-2020	12-Apr-2021	✔
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014,							
0958_POT101_201014,	0958_POT105_201014,							
0958_QC301_201014,	0958_QC401_201014							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0958_MW114_201014,	0958_POT104_201014,	14-Oct-2020	19-Oct-2020	12-Apr-2021	✔	20-Oct-2020	12-Apr-2021	✔
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014,							
0958_POT101_201014,	0958_POT105_201014,							
0958_QC301_201014,	0958_QC401_201014							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0958_MW114_201014,	0958_POT104_201014,	14-Oct-2020	19-Oct-2020	12-Apr-2021	✔	20-Oct-2020	12-Apr-2021	✔
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014,							
0958_POT101_201014,	0958_POT105_201014,							
0958_QC301_201014,	0958_QC401_201014							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0958_MW114_201014,	0958_POT104_201014,	14-Oct-2020	19-Oct-2020	12-Apr-2021	✔	20-Oct-2020	12-Apr-2021	✔
0958_QC102_201014,	0958_MW123_I_201014,							
0958_QC101_201014,	0958_POT103_201014,							
0958_POT101_201014,	0958_POT105_201014,							
0958_QC301_201014,	0958_QC401_201014							



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	3	23	13.04	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	20	15.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	3	23	13.04	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	3	20	15.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	17	17.65	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	21	14.29	10.53	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	23	17.39	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	20	20.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	23	17.39	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	20	20.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	17	23.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	21	19.05	10.53	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	23	8.70	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	17	11.76	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	21	9.52	5.26	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	2	20	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

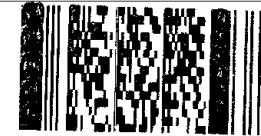
Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



Environmental Division
Perth
Work Order Reference
EP2011227



Telephone : + 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEF19009/GINGIN Client: CARDNO

Project Manager

Phone:

ALS Compass COC Reference: 15-929 # Samples: _____

Sampler:

Phone: (_____)

Turnaround Requirements: Standard _____ Urgent _____

Special Instructions:

Please send QC203 to Eurofins
QC204

ALS Use Only

Custody seal intact?

YES NO N/A

Free ice / frozen ice bricks upon receipt?

YES NO N/A

Random sample temperature on receipt?

16.6 °C

Custody:

Relinquished by:

Received by:

Relinquished by:

Received by:

Date / Time:

Date / Time:

Date / Time:

Date / Time:

15/10/20 14:10

**CHAIN OF CUSTODY**

COC#: 14929

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER: [REDACTED]

PRIMARY SAMPLER: [REDACTED]

EMAIL REPORTS TO: [REDACTED]

EMAIL INVOICES TO: [REDACTED]

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW306		15/10/2020 08:53 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_QC103		15/10/2020 08:55 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0958_MW304		15/10/2020 08:56 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_MW305		15/10/2020 08:57 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_MW310		15/10/2020 11:05 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0958_MW308		15/10/2020 11:07 AM	Water	ALS: 6 Non ALS: 0	No	X			extra PFA bottle for lab QC
007	0958_MW309		15/10/2020 11:11 AM	Water	ALS: 4 Non ALS: 0	No	X			
008	0958_MW307		15/10/2020 11:12 AM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_QC301		15/10/2020 11:14 AM	Water	ALS: 2 Non ALS: 0	No		X		



ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

·C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_QC401		15/10/2020 11:15 AM	Water	ALS: 2 Non ALS: 0	No		X		
011	0958_MW313		15/10/2020 12:09 PM	Water	ALS: 4 Non ALS: 0	No	X			
012	0958_QC104		15/10/2020 12:10 PM	Water	ALS: 4 Non ALS: 0	No	X			
013	0958_MW401		15/10/2020 12:24 PM	Water	ALS: 4 Non ALS: 0	No	X			



ALS Laboratory: EP Perth

RECEIVED BY:

DATE TIME:

Other comments:

EMAIL INVOICES TO:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW306	HDPE (no PTFE)	20 mL	00352005006268	Grey	No	
001	0958_MW306	HDPE (no PTFE)	20 mL	00352005006513	Grey	No	
001	0958_MW306	Clear Plastic Bottle - Natural	250 mL	00070719062478	Green	No	
001	0958_MW306	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058063	Purple	No	
002	0958_QC103	HDPE (no PTFE)	20 mL	00352005005307	Grey	No	
002	0958_QC103	HDPE (no PTFE)	20 mL	00352005006435	Grey	No	
002	0958_QC103	Clear Plastic Bottle - Natural	250 mL	00070719062509	Green	No	
002	0958_QC103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023909	Purple	No	
003	0958_MW304	HDPE (no PTFE)	20 mL	00352005005232	Grey	No	
003	0958_MW304	HDPE (no PTFE)	20 mL	00352005005273	Grey	No	
003	0958_MW304	Clear Plastic Bottle - Natural	250 mL	00070519145976	Green	No	
003	0958_MW304	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057994	Purple	No	
004	0958_MW305	HDPE (no PTFE)	20 mL	00352005007194	Grey	No	
004	0958_MW305	HDPE (no PTFE)	20 mL	00352005007408	Grey	No	
004	0958_MW305	Clear Plastic Bottle - Natural	250 mL	00070719030854	Green	No	
004	0958_MW305	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056909	Purple	No	
005	0958_MW310	Clear Plastic Bottle - Natural	250 mL	00070719062409	Green	No	
005	0958_MW310	HDPE (no PTFE)	20 mL	00352005006477	Grey	No	
005	0958_MW310	HDPE (no PTFE)	20 mL	00352005006412	Grey	No	
005	0958_MW310	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058086	Purple	No	
006	0958_MW308	HDPE (no PTFE)	20 mL	00352005006758	Grey	No	
006	0958_MW308	HDPE (no PTFE)	20 mL	00352005006620	Grey	No	
006	0958_MW308	HDPE (no PTFE)	20 mL	00352005006486	Grey	No	
006	0958_MW308	HDPE (no PTFE)	20 mL	00352005005075	Grey	No	
006	0958_MW308	Clear Plastic Bottle - Natural	250 mL	00070719062564	Green	No	
006	0958_MW308	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057837	Purple	No	



RECEIVED BY:

DATE TIME:

EMAIL INVOICES TO:

Biohazard info:

LABORATORY USE ONLY (Circle)

Other comments:

Total Bottle Count: ALS: 50, Non ALS: 0

CERTIFICATE OF ANALYSIS

Work Order : **EP2011227**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 14929
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 13
No. of samples analysed : 13

Page : 1 of 11
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 15-Oct-2020 14:10
Date Analysis Commenced : 22-Oct-2020
Issue Date : 23-Oct-2020 21:53



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW306_201015	0958_QC103_201015	0958_MW304_201015	0958_MW305_201015	0958_MW310_201015
Client sampling date / time				15-Oct-2020 08:53	15-Oct-2020 08:55	15-Oct-2020 08:56	15-Oct-2020 08:57	15-Oct-2020 11:05
Compound	CAS Number	LOR	Unit	EP2011227-001	EP2011227-002	EP2011227-003	EP2011227-004	EP2011227-005
				Result	Result	Result	Result	Result
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	18	18	23	19	9
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.16	0.14	0.61	0.10	0.57
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.21	0.20	0.45	0.08	0.55
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	3.19	2.98	2.79	1.75	1.55
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.34	0.34	0.21	0.18	0.04
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.78	2.86	1.81	2.79	4.43
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.2	<0.2	0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.06	0.06	0.21	<0.05	0.24
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.35	0.31	0.79	0.18	1.44
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.04	0.04	0.07	<0.05	0.12
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.29	0.26	0.18	0.16	0.05
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	0.04
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.12	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	0.03
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.12	<0.05



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW306_201015	0958_QC103_201015	0958_MW304_201015	0958_MW305_201015	0958_MW310_201015
Client sampling date / time				15-Oct-2020 08:53	15-Oct-2020 08:55	15-Oct-2020 08:56	15-Oct-2020 08:57	15-Oct-2020 11:05
Compound	CAS Number	LOR	Unit	EP2011227-001	EP2011227-002	EP2011227-003	EP2011227-004	EP2011227-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.12	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.12	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.12	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.05	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	0.08
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	0.15
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	7.42	7.19	7.32	5.24	9.41
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	5.97	5.84	4.60	4.54	5.98
Sum of PFAS (WA DER List)	----	0.01	µg/L	6.87	6.65	6.66	4.98	8.73
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	95.9	103	98.0	96.1	98.3
13C8-PFOA	----	0.02	%	92.9	92.1	95.9	95.2	94.0



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW308_201015	0958_MW309_201015	0958_MW307_201015	0958_MW313_201015	0958_QC104_201015
Client sampling date / time				15-Oct-2020 11:07	15-Oct-2020 11:11	15-Oct-2020 11:12	15-Oct-2020 12:09	15-Oct-2020 12:10
Compound	CAS Number	LOR	Unit	EP2011227-006	EP2011227-007	EP2011227-008	EP2011227-011	EP2011227-012
				Result	Result	Result	Result	Result
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	11	17	19	23	23
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	1.06	0.51	1.17	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	1.70	0.95	1.04	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	14.4	7.43	9.54	0.09	0.09
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.45	0.62	0.68	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	8.52	16.2	14.2	0.04	0.03
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.3	0.1	0.2	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.47	0.31	0.43	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	2.46	2.15	2.60	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.50	0.22	0.19	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.51	0.44	0.42	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW308_201015	0958_MW309_201015	0958_MW307_201015	0958_MW313_201015	0958_QC104_201015
Client sampling date / time				15-Oct-2020 11:07	15-Oct-2020 11:11	15-Oct-2020 11:12	15-Oct-2020 12:09	15-Oct-2020 12:10
Compound	CAS Number	LOR	Unit	EP2011227-006	EP2011227-007	EP2011227-008	EP2011227-011	EP2011227-012
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	30.4	28.9	30.5	0.13	0.12
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	22.9	23.6	23.7	0.13	0.12
Sum of PFAS (WA DER List)	----	0.01	µg/L	28.2	27.4	28.8	0.13	0.12
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	98.3	92.8	93.8	103	109
13C8-PFOA	----	0.02	%	94.5	95.2	93.0	102	102



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

0958_MW401_201015

Client sampling date / time

15-Oct-2020 12:24

Compound CAS Number LOR Unit

EP2011227-013

Result

EP002: Dissolved Organic Carbon (DOC)

Dissolved Organic Carbon 1 mg/L

6

EP231A: Perfluoroalkyl Sulfonic Acids

Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

0958_MW401_201015

Client sampling date / time

15-Oct-2020 12:24

Compound

CAS Number

LOR

Unit

EP2011227-013

Result

EP231C: Perfluoroalkyl Sulfonamides - Continued

N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

EP231S: PFAS Surrogate

13C4-PFOS	----	0.02	%	103	----	----	----	----
13C8-PFOA	----	0.02	%	98.8	----	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				0958_QC301_201015	0958_QC401_201015	----	----	----
Client sampling date / time				15-Oct-2020 11:14	15-Oct-2020 11:15	----	----	----
Compound	CAS Number	LOR	Unit	EP2011227-009	EP2011227-010	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				0958_QC301_201015	0958_QC401_201015	----	----	----
Client sampling date / time				15-Oct-2020 11:14	15-Oct-2020 11:15	----	----	----
Compound	CAS Number	LOR	Unit	EP2011227-009	EP2011227-010	-----	-----	-----
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	110	102	----	----	----
13C8-PFOA	----	0.02	%	108	98.6	----	----	----



Surrogate Control Limits

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

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

QUALITY CONTROL REPORT

Work Order	: EP2011227	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 15-Oct-2020
Order number	: DEF19009/330	Date Analysis Commenced	: 22-Oct-2020
C-O-C number	: 14929	Issue Date	: 23-Oct-2020
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 13		
No. of samples analysed	: 13		



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3323729)									
EP2011227-001	0958_MW306_201015	EP002: Dissolved Organic Carbon	----	1	mg/L	18	18	0.00	0% - 50%
EP2011227-013	0958_MW401_201015	EP002: Dissolved Organic Carbon	----	1	mg/L	6	6	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3320992)									
EP2011227-004	0958_MW305_201015	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.79	2.94	5.40	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.10	0.10	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	0.08	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.75	1.69	3.49	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.18	0.18	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.05	<0.05	0.00	No Limit
ES2036509-002	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.05	0.05	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.05	<0.05	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3320992)									
EP2011227-004	0958_MW305_201015	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.16	0.16	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.05	0.06	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.18	0.18	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDODA)	307-55-1	0.02	µg/L	<0.05	<0.05	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3320992) - continued									
EP2011227-004	0958_MW305_201015	EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.2	<0.2	0.00	No Limit
ES2036509-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.18	0.17	8.45	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.05	0.06	18.2	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.2	<0.2	0.00	No Limit
		EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3320992)							
EP2011227-004	0958_MW305_201015	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.12	<0.12	0.00	No Limit
ES2036509-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.12	<0.12	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.12	<0.12	0.00	No Limit

Page : 4 of 7
 Work Order : EP2011227
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3320992)									
EP2011227-004	0958_MW305_201015	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2036509-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3320992)									
EP2011227-004	0958_MW305_201015	EP231X: Sum of PFAS	----	0.01	µg/L	5.24	5.39	2.82	0% - 20%
ES2036509-002	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.18	0.28	43.5	No Limit

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

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
		LCS	Low	High
Result				
<1	10 mg/L	105	73.2	116
<1	100 mg/L	105	73.2	116
<0.02	0.25 µg/L	83.0	72.0	130
<0.02	0.25 µg/L	90.8	71.0	127
<0.02	0.25 µg/L	88.6	68.0	131
<0.02	0.25 µg/L	89.4	69.0	134
<0.01	0.25 µg/L	79.6	65.0	140
<0.02	0.25 µg/L	95.4	53.0	142
<0.1	1.25 µg/L	77.0	73.0	129
<0.02	0.25 µg/L	75.4	72.0	129
<0.02	0.25 µg/L	75.6	72.0	129
<0.02	0.25 µg/L	77.0	72.0	130
<0.01	0.25 µg/L	87.2	71.0	133
<0.02	0.25 µg/L	92.4	69.0	130
<0.02	0.25 µg/L	77.2	71.0	129
<0.02	0.25 µg/L	72.4	69.0	133
<0.02	0.25 µg/L	79.8	72.0	134
<0.02	0.25 µg/L	72.0	65.0	144
<0.05	0.625 µg/L	83.0	71.0	132
<0.02	0.25 µg/L	74.2	67.0	137
<0.05	0.625 µg/L	71.5	68.0	141
<0.05	0.625 µg/L	73.8	62.6	147
<0.05	0.625 µg/L	66.6	66.0	145
<0.05	0.625 µg/L	80.0	57.6	145
<0.02	0.25 µg/L	74.2	65.0	136
<0.02	0.25 µg/L	71.6	61.0	135



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit			Result	LCS	Low
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3320992) - continued								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	74.6	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	82.2	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	93.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	82.8	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3323729)							
EP2011227-002	0958_QC103_201015	EP002: Dissolved Organic Carbon	----	100 mg/L	106	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3320992)							
EP2011227-006	0958_MW308_201015	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	# Not Determined	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	# Not Determined	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	97.9	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	102	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3320992)							
EP2011227-006	0958_MW308_201015	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	102	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	96.9	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	105	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	98.3	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	91.4	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	81.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	90.2	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	81.0	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	74.6	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	99.1	71.0	132



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3320992)							
EP2011227-006	0958_MW308_201015	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	80.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	77.2	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	88.2	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	77.6	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	74.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	85.4	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	81.6	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3320992)							
EP2011227-006	0958_MW308_201015	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	80.2	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	101	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	117	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	89.0	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order : EP2011227

Page : 1 of 6

Client : CARDNO (WA) PTY LTD
Contact :
Project : WA_0958_PFASOMP
Site : DEF19009/Gingin
Sampler :
Order number : DEF19009/330

Laboratory : Environmental Division Perth
Telephone :
Date Samples Received : 15-Oct-2020
Issue Date : 23-Oct-2020
No. of samples received : 13
No. of samples analysed : 13

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2011227--006	0958_MW308_201015	Perfluorobutane sulfonic acid (PFBS)	375-73-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2011227--006	0958_MW308_201015	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2011227--006	0958_MW308_201015	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2011227--006	0958_MW308_201015	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	EP2011227--006	0958_MW308_201015	Perfluorohexanoic acid (PFHxA)	307-24-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

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

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		15-Oct-2020	----	----	----	22-Oct-2020	12-Nov-2020	✓
0958_MW306_201015,	0958_QC103_201015,							
0958_MW304_201015,	0958_MW305_201015,							
0958_MW310_201015,	0958_MW308_201015,							
0958_MW309_201015,	0958_MW307_201015,							
0958_MW313_201015,	0958_QC104_201015,							
0958_MW401_201015								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		15-Oct-2020	22-Oct-2020	13-Apr-2021	✔	22-Oct-2020	13-Apr-2021	✔
0958_MW306_201015,	0958_QC103_201015,							
0958_MW304_201015,	0958_MW305_201015,							
0958_MW310_201015,	0958_MW308_201015,							
0958_MW309_201015,	0958_MW307_201015,							
0958_QC301_201015,	0958_QC401_201015,							
0958_MW313_201015,	0958_QC104_201015,							
0958_MW401_201015								
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		15-Oct-2020	22-Oct-2020	13-Apr-2021	✔	22-Oct-2020	13-Apr-2021	✔
0958_MW306_201015,	0958_QC103_201015,							
0958_MW304_201015,	0958_MW305_201015,							
0958_MW310_201015,	0958_MW308_201015,							
0958_MW309_201015,	0958_MW307_201015,							
0958_QC301_201015,	0958_QC401_201015,							
0958_MW313_201015,	0958_QC104_201015,							
0958_MW401_201015								
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		15-Oct-2020	22-Oct-2020	13-Apr-2021	✔	22-Oct-2020	13-Apr-2021	✔
0958_MW306_201015,	0958_QC103_201015,							
0958_MW304_201015,	0958_MW305_201015,							
0958_MW310_201015,	0958_MW308_201015,							
0958_MW309_201015,	0958_MW307_201015,							
0958_QC301_201015,	0958_QC401_201015,							
0958_MW313_201015,	0958_QC104_201015,							
0958_MW401_201015								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		15-Oct-2020	22-Oct-2020	13-Apr-2021	✔	22-Oct-2020	13-Apr-2021	✔
0958_MW306_201015,	0958_QC103_201015,							
0958_MW304_201015,	0958_MW305_201015,							
0958_MW310_201015,	0958_MW308_201015,							
0958_MW309_201015,	0958_MW307_201015,							
0958_QC301_201015,	0958_QC401_201015,							
0958_MW313_201015,	0958_QC104_201015,							
0958_MW401_201015								



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)	15-Oct-2020	22-Oct-2020	13-Apr-2021	✔	22-Oct-2020	13-Apr-2021	✔	
0958_MW306_201015,								0958_QC103_201015,
0958_MW304_201015,								0958_MW305_201015,
0958_MW310_201015,								0958_MW308_201015,
0958_MW309_201015,								0958_MW307_201015,
0958_QC301_201015,								0958_QC401_201015,
0958_MW313_201015,								0958_QC104_201015,
0958_MW401_201015								



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

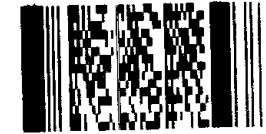
The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The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

Analytical Methods	Method	Matrix	Method Descriptions
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



Environmental Division
Perth

Work Order Reference
EP2011490



Telephone : + 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEF19009 Client: CARDNO Project Manager: [REDACTED]
ALS Compass COC Reference: 15116 # Samples: Phone: [REDACTED]
Turnaround Requirements: Standard 4 Urgent Sampler: [REDACTED]
Phone: [REDACTED]

Special Instructions:

ALS Use Only

Custody seal intact? YES NO N/A
Free ice / frozen ice bricks upon receipt? YES NO N/A
Random sample temperature on receipt? 13.4 / 29.1 °C

Custody	[REDACTED]	Received by:	Relinquished by:	Received by:
Relinquished	[REDACTED]			[REDACTED]
Date / Time:	<u>21/10/20</u>	Date / Time:	Date / Time:	<u>21/10 1640</u>

**CHAIN OF CUSTODY**

COC#: 15116

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER: [REDACTED]

PRIMARY SAMPLER: [REDACTED]

EMAIL REPORTS TO: [REDACTED]

EMAIL INVOICES TO: [REDACTED]

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH: [REDACTED]

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsale WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW102		21/10/2020 09:20 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_MW302		21/10/2020 09:46 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0958_MW303		21/10/2020 09:58 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_MW301		21/10/2020 10:07 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_MW112		21/10/2020 10:25 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0958_MW113		21/10/2020 10:38 AM	Water	ALS: 4 Non ALS: 0	No	X			
007	0958_MW109		21/10/2020 10:54 AM	Water	ALS: 4 Non ALS: 0	No	X			
008	0958_MW110		21/10/2020 11:14 AM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_MW122		21/10/2020 11:32 AM	Water	ALS: 4 Non ALS: 0	No	X			



CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA 0958 PFASOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO

EMAIL INVOICES TO

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

·C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_MW124		21/10/2020 11:55 AM	Water	ALS: 4 Non ALS: 0	No	X			
011	0958_MW121		21/10/2020 12:21 PM	Water	ALS: 4 Non ALS: 0	No	X			
012	0958_MW120		21/10/2020 12:37 PM	Water	ALS: 4 Non ALS: 0	No	X			
013	0958_MW118		21/10/2020 01:01 PM	Water	ALS: 4 Non ALS: 0	No	X			
014	0958_MW117		21/10/2020 01:15 PM	Water	ALS: 4 Non ALS: 0	No	X			
015	0958_MW116		21/10/2020 01:26 PM	Water	ALS: 4 Non ALS: 0	No	X			
016	0958_POT102		21/10/2020 01:40 PM	Water	ALS: 4 Non ALS: 0	No	X			
017	0958_MW115		21/10/2020 01:56 PM	Water	ALS: 4 Non ALS: 0	No	X			
018	0958_MW312		21/10/2020 02:15 PM	Water	ALS: 4 Non ALS: 0	No	X			

 CHAIN OF CUSTODY (ALS) COC#: 15116 ALS Laboratory: EP Perth		RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:	RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:
CLIENT: CARBSD - CARDNO (WA) PTY LTD PROJECT: WA_0958_PFSOMP SITE: SPM DEF19009/Gingin - GW ORDER NO: DEF19009/330 PROJECT MANAGER: [REDACTED] PRIMARY SAMPLER: [REDACTED] EMAIL REPORTS TO: [REDACTED] EMAIL INVOICES TO: [REDACTED]		TURNAROUND REQUIREMENTS : 5 Days Biohazard info:		LABORATORY USE ONLY (Circle) Custody Seal intact? Yes No N/A Free ice / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: °C Other comments:	
CONTACT PH: SAMPLER MOBILE: QUOTE NO: SY/139/19 / ES2019CARBSD0002					

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
019	0958_MW311		21/10/2020 02:28 PM	Water	ALS: 4 Non ALS: 0	No	X			
020	0958_MW104 ³		21/10/2020 02:46 PM	Water	ALS: 4 Non ALS: 0	No	X			
021	0958_MW105		21/10/2020 03:20 PM	Water	ALS: 4 Non ALS: 0	No	X			
022	0958_QC301		21/10/2020 03:39 PM	Water	ALS: 2 Non ALS: 0	No		X		
023	0958_QC401		21/10/2020 03:40 PM	Water	ALS: 2 Non ALS: 0	No		X		

MW104



CHAIN OF CUSTODY

COC#: 15116

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO

EMAIL INVOICES TO

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058372	Purple	No	
001	0958_MW102	Clear Plastic Bottle - Natural	250 mL	00070719062344	Green	No	
001	0958_MW102	HDPE (no PTFE)	20 mL	00352005006465	Grey	No	
001	0958_MW102	HDPE (no PTFE)	20 mL	00352005005277	Grey	No	
002	0958_MW302	Clear Plastic Bottle - Natural	250 mL	00070719062548	Green	No	
002	0958_MW302	HDPE (no PTFE)	20 mL	00352005005208	Grey	No	
002	0958_MW302	HDPE (no PTFE)	20 mL	00352005006298	Grey	No	
002	0958_MW302	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058157	Purple	No	
003	0958_MW303	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057857	Purple	No	
003	0958_MW303	Clear Plastic Bottle - Natural	250 mL	00070719062353	Green	No	
003	0958_MW303	HDPE (no PTFE)	20 mL	00352005005249	Grey	No	
003	0958_MW303	HDPE (no PTFE)	20 mL	00352005006307	Grey	No	
004	0958_MW301	Clear Plastic Bottle - Natural	250 mL	00070719062533	Green	No	
004	0958_MW301	HDPE (no PTFE)	20 mL	00350019035159	Grey	No	
004	0958_MW301	HDPE (no PTFE)	20 mL	00350019026925	Grey	No	
004	0958_MW301	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058077	Purple	No	
005	0958_MW112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058146	Purple	No	
005	0958_MW112	Clear Plastic Bottle - Natural	250 mL	00070719062556	Green	No	
005	0958_MW112	HDPE (no PTFE)	20 mL	00352005006554	Grey	No	
005	0958_MW112	HDPE (no PTFE)	20 mL	00352005005243	Grey	No	
006	0958_MW113	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058371	Purple	No	
006	0958_MW113	Clear Plastic Bottle - Natural	250 mL	00070719062504	Green	No	
006	0958_MW113	HDPE (no PTFE)	20 mL	00352005005356	Grey	No	
006	0958_MW113	HDPE (no PTFE)	20 mL	00352005006431	Grey	No	
007	0958_MW109	Clear Plastic Bottle - Natural	250 mL	00070719062348	Green	No	
007	0958_MW109	HDPE (no PTFE)	20 mL	00352005006322	Grey	No	



CHAIN OF CUSTODY

COC#: 15116

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER

PRIMARY SAMPLER:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

007	0958_MW109	HDPE (no PTFE)	20 mL	00352005005134	Grey	No	
007	0958_MW109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058289	Purple	No	
008	0958_MW110	Clear Plastic Bottle - Natural	250 mL	00070719062434	Green	No	
008	0958_MW110	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058237	Purple	No	
008	0958_MW110	HDPE (no PTFE)	20 mL	00352005005108	Grey	No	
008	0958_MW110	HDPE (no PTFE)	20 mL	00352005006520	Grey	No	
009	0958_MW122	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058231	Purple	No	
009	0958_MW122	Clear Plastic Bottle - Natural	250 mL	00070719062425	Green	No	
009	0958_MW122	HDPE (no PTFE)	20 mL	00352005005218	Grey	No	
009	0958_MW122	HDPE (no PTFE)	20 mL	00352005006474	Grey	No	
010	0958_MW124	Clear Plastic Bottle - Natural	250 mL	00070719062505	Green	No	
010	0958_MW124	HDPE (no PTFE)	20 mL	00352005006323	Grey	No	
010	0958_MW124	HDPE (no PTFE)	20 mL	00352005006429	Grey	No	
010	0958_MW124	Amber TOC Vial - Sulfuric Acid	40 mL	00180220058376	Purple	No	
011	0958_MW121	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058081	Purple	No	
011	0958_MW121	Clear Plastic Bottle - Natural	250 mL	00070719062471	Green	No	
011	0958_MW121	HDPE (no PTFE)	20 mL	00352005006301	Grey	No	
011	0958_MW121	HDPE (no PTFE)	20 mL	00352005006517	Grey	No	
012	0958_MW120	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057962	Purple	No	
012	0958_MW120	Clear Plastic Bottle - Natural	250 mL	00070719062106	Green	No	
012	0958_MW120	HDPE (no PTFE)	20 mL	00352005006490	Grey	No	
012	0958_MW120	HDPE (no PTFE)	20 mL	00352005006487	Grey	No	
013	0958_MW118	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058219	Purple	No	
013	0958_MW118	Clear Plastic Bottle - Natural	250 mL	00070719062422	Green	No	
013	0958_MW118	HDPE (no PTFE)	20 mL	00352005006467	Grey	No	
013	0958_MW118	HDPE (no PTFE)	20 mL	00352005005246	Grey	No	
014	0958_MW117	Clear Plastic Bottle - Natural	250 mL	00070719062506	Green	No	



ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA 0958_PFASOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER

PRIMARY SAMPLER:

EMAIL REPORTS TO

EMAIL INVOICES TO

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

·C

Other comments:

014	0958_MW117	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058059	Purple	No	
014	0958_MW117	HDPE (no PTFE)	20 mL	00352005005336	Grey	No	
014	0958_MW117	HDPE (no PTFE)	20 mL	00352005005195	Grey	No	
015	0958_MW116	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058111	Purple	No	
015	0958_MW116	Clear Plastic Bottle - Natural	250 mL	00070719062544	Green	No	
015	0958_MW116	HDPE (no PTFE)	20 mL	00352005006303	Grey	No	
015	0958_MW116	HDPE (no PTFE)	20 mL	00352005006535	Grey	No	
016	0958_POT102	Clear Plastic Bottle - Natural	250 mL	00070719062512	Green	No	
016	0958_POT102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057894	Purple	No	
016	0958_POT102	HDPE (no PTFE)	20 mL	00352005005346	Grey	No	
016	0958_POT102	HDPE (no PTFE)	20 mL	00352005005169	Grey	No	
017	0958_MW115	Clear Plastic Bottle - Natural	250 mL	00070719062442	Green	No	
017	0958_MW115	HDPE (no PTFE)	20 mL	00352005006405	Grey	No	
017	0958_MW115	HDPE (no PTFE)	20 mL	00352005006447	Grey	No	
017	0958_MW115	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058123	Purple	No	
018	0958_MW312	Clear Plastic Bottle - Natural	250 mL	00071119091268	Green	No	
018	0958_MW312	HDPE (no PTFE)	20 mL	00352005006743	Grey	No	
018	0958_MW312	HDPE (no PTFE)	20 mL	00352005006829	Grey	No	
018	0958_MW312	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023584	Purple	No	
019	0958_MW311	Clear Plastic Bottle - Natural	250 mL	00071119091255	Green	No	
019	0958_MW311	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023614	Purple	No	
019	0958_MW311	HDPE (no PTFE)	20 mL	00352005006712	Grey	No	
019	0958_MW311	HDPE (no PTFE)	20 mL	00352005002711	Grey	No	
020	0958_MW104	Clear Plastic Bottle - Natural	250 mL	00071119091233	Green	No	
020	0958_MW104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023866	Purple	No	
020	0958_MW104	HDPE (no PTFE)	20 mL	00352005006630	Grey	No	
020	0958_MW104	HDPE (no PTFE)	20 mL	00352005006796	Grey	No	

**CHAIN OF CUSTODY**

COC#: 15116

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

C

Other comments:

021	0958_MW105	Clear Plastic Bottle - Natural	250 mL	00071119091318	Green	No	
021	0958_MW105	Amber TOC Vial - Sulfuric Acid	40 mL	00180220023621	Purple	No	
021	0958_MW105	HDPE (no PTFE)	20 mL	00352005006783	Grey	No	
021	0958_MW105	HDPE (no PTFE)	20 mL	00352005006649	Grey	No	
022	0958_QC301	HDPE (no PTFE)	20 mL	00350019026834	Grey	No	
022	0958_QC301	HDPE (no PTFE)	20 mL	00350019034987	Grey	No	
023	0958_QC401	HDPE (no PTFE)	20 mL	00350019154460	Grey	No	
023	0958_QC401	HDPE (no PTFE)	20 mL	00350019154372	Grey	No	

Total Bottle Count: ALS: 88, Non ALS: 0

CERTIFICATE OF ANALYSIS

Work Order : **EP2011490**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 15116
Sampler : [REDACTED] [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 24
No. of samples analysed : 24

Page : 1 of 20
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 21-Oct-2020 16:40
Date Analysis Commenced : 22-Oct-2020
Issue Date : 30-Oct-2020 17:39



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- ED041G (Sulfate Turbidimetric): LOR for sample EP2011490-021 raised due to possible sample matrix interference.
- ED041G: Turbidimetric sulfate LOR raised for various samples due to possible sample matrix interference.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- EA025H (Suspended Solids): Insufficient sample has been provided for standard analysis for sample #14. Where applicable LOR values have been adjusted accordingly.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW102_201021	0958_MW302_201021	0958_MW303_201021	0958_MW301_201021	0958_MW112_201021
Client sampling date / time				21-Oct-2020 09:20	21-Oct-2020 09:46	21-Oct-2020 09:58	21-Oct-2020 10:07	21-Oct-2020 10:25
Compound	CAS Number	LOR	Unit	EP2011490-001	EP2011490-002	EP2011490-003	EP2011490-004	EP2011490-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.10	4.08	3.95	3.64	3.95
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	90	134	114	158	125
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	186	72	112	167
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	10	<1	<1	<1	<1
Total Alkalinity as CaCO3	----	1	mg/L	10	<1	<1	<1	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<2	<2	<2	<2
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	16	16	19	19	17
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	8	6	9	6
Magnesium	7439-95-4	1	mg/L	1	<1	1	1	<1
Sodium	7440-23-5	1	mg/L	15	9	11	11	9
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	0.65	0.45	0.54	0.54	0.48
∅ Total Cations	----	0.01	meq/L	0.73	0.79	0.86	1.01	0.69
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	21	19	18	30	26
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.04	0.16	0.23	0.42	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.05	0.31	0.61	1.49	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.34	3.02	5.35	8.16	0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.02	0.79	0.83	0.29	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW102_201021	0958_MW302_201021	0958_MW303_201021	0958_MW301_201021	0958_MW112_201021
Client sampling date / time				21-Oct-2020 09:20	21-Oct-2020 09:46	21-Oct-2020 09:58	21-Oct-2020 10:07	21-Oct-2020 10:25
Compound	CAS Number	LOR	Unit	EP2011490-001	EP2011490-002	EP2011490-003	EP2011490-004	EP2011490-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.15	4.02	16.2	32.3	0.05
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.09	0.17	0.39	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.03	0.56	1.04	2.91	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.08	0.18	0.44	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	0.66	0.80	1.24	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW102_201021	0958_MW302_201021	0958_MW303_201021	0958_MW301_201021	0958_MW112_201021
Client sampling date / time				21-Oct-2020 09:20	21-Oct-2020 09:46	21-Oct-2020 09:58	21-Oct-2020 10:07	21-Oct-2020 10:25
Compound	CAS Number	LOR	Unit	EP2011490-001	EP2011490-002	EP2011490-003	EP2011490-004	EP2011490-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.64	9.69	25.4	47.7	0.07
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.49	7.04	21.6	40.5	0.07
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.57	8.59	24.0	46.0	0.07
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	97.2	98.5	104	98.9	106
13C8-PFOA	----	0.02	%	102	106	102	104	106



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW113_201021	0958_MW109_201021	0958_MW110_201021	0958_MW122_201021	0958_MW124_201021
Client sampling date / time				21-Oct-2020 10:38	21-Oct-2020 10:54	21-Oct-2020 11:14	21-Oct-2020 11:32	21-Oct-2020 11:55
Compound	CAS Number	LOR	Unit	EP2011490-006	EP2011490-007	EP2011490-008	EP2011490-009	EP2011490-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	3.91	4.36	4.56	4.30	5.82
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	142	154	194	151	994
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	61	156	98	665	1990
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	<1	<1	10
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	<1	10
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<2	30	8	<2	1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	29	16	21	26	52
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	4	4	3	4	1
Magnesium	7439-95-4	1	mg/L	1	4	3	2	2
Sodium	7440-23-5	1	mg/L	14	11	11	15	28
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	4
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	0.82	1.08	0.76	0.73	1.69
∅ Total Cations	----	0.01	meq/L	0.89	1.01	0.88	1.02	1.53
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	31	31	33	34	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	----	----	----	10
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.05	0.03	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW113_201021	0958_MW109_201021	0958_MW110_201021	0958_MW122_201021	0958_MW124_201021
Client sampling date / time				21-Oct-2020 10:38	21-Oct-2020 10:54	21-Oct-2020 11:14	21-Oct-2020 11:32	21-Oct-2020 11:55
Compound	CAS Number	LOR	Unit	EP2011490-006	EP2011490-007	EP2011490-008	EP2011490-009	EP2011490-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.01	0.31	0.11	0.02	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW113_201021	0958_MW109_201021	0958_MW110_201021	0958_MW122_201021	0958_MW124_201021
Client sampling date / time				21-Oct-2020 10:38	21-Oct-2020 10:54	21-Oct-2020 11:14	21-Oct-2020 11:32	21-Oct-2020 11:55
Compound	CAS Number	LOR	Unit	EP2011490-006	EP2011490-007	EP2011490-008	EP2011490-009	EP2011490-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.01	0.36	0.14	0.02	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.01	0.36	0.14	0.02	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.01	0.36	0.14	0.02	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	92.6	99.8	98.4	97.4	105
13C8-PFOA	----	0.02	%	94.1	102	101	98.8	98.8



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW121_201021	0958_MW120_201021	0958_MW118_201021	0958_MW117_201021	0958_MW116_201021
Client sampling date / time				21-Oct-2020 12:21	21-Oct-2020 12:37	21-Oct-2020 13:01	21-Oct-2020 13:15	21-Oct-2020 13:26
Compound	CAS Number	LOR	Unit	EP2011490-011	EP2011490-012	EP2011490-013	EP2011490-014	EP2011490-015
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.58	5.28	6.27	6.23	4.18
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	192	101	114	56	142
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	41	148	18	<10	283
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	50	2	23	12	<1
Total Alkalinity as CaCO3	----	1	mg/L	50	2	23	12	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	8	<1	<1	<2
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	50	13	54	25	25
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	10	5	2	<1	4
Magnesium	7439-95-4	1	mg/L	2	2	3	2	3
Sodium	7440-23-5	1	mg/L	32	7	30	19	15
Potassium	7440-09-7	1	mg/L	2	<1	2	<1	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	2.41	0.57	1.98	0.94	0.70
∅ Total Cations	----	0.01	meq/L	2.11	0.72	1.70	0.99	1.10
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	15	23	12	16	40
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.06
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW121_201021	0958_MW120_201021	0958_MW118_201021	0958_MW117_201021	0958_MW116_201021
Client sampling date / time				21-Oct-2020 12:21	21-Oct-2020 12:37	21-Oct-2020 13:01	21-Oct-2020 13:15	21-Oct-2020 13:26
Compound	CAS Number	LOR	Unit	EP2011490-011	EP2011490-012	EP2011490-013	EP2011490-014	EP2011490-015
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW121_201021	0958_MW120_201021	0958_MW118_201021	0958_MW117_201021	0958_MW116_201021
Client sampling date / time				21-Oct-2020 12:21	21-Oct-2020 12:37	21-Oct-2020 13:01	21-Oct-2020 13:15	21-Oct-2020 13:26
Compound	CAS Number	LOR	Unit	EP2011490-011	EP2011490-012	EP2011490-013	EP2011490-014	EP2011490-015
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	0.07
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	0.07
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	0.07
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	87.3	94.4	94.5	94.8	101
13C8-PFOA	----	0.02	%	101	97.1	102	99.8	102



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_POT102_20102 1	0958_MW115_201021	0958_MW312_201021	0958_MW311_201021	0958_MW103_201021
Client sampling date / time				21-Oct-2020 13:40	21-Oct-2020 13:56	21-Oct-2020 14:15	21-Oct-2020 14:28	21-Oct-2020 14:46
Compound	CAS Number	LOR	Unit	EP2011490-016	EP2011490-017	EP2011490-018	EP2011490-019	EP2011490-020
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.60	3.84	6.12	6.26	6.33
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	294	148	146	124	196
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	305	32	260	356
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	82	<1	8	9	16
Total Alkalinity as CaCO3	----	1	mg/L	82	<1	8	9	16
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	<2	<2	7	9
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	138	21	29	22	18
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	26	6	8	7	9
Magnesium	7439-95-4	1	mg/L	5	1	2	1	2
Sodium	7440-23-5	1	mg/L	77	10	20	16	11
Potassium	7440-09-7	1	mg/L	2	<1	2	4	1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	5.57	0.59	0.98	0.95	1.01
∅ Total Cations	----	0.01	meq/L	5.11	0.82	1.48	1.23	1.12
∅ Ionic Balance	----	0.01	%	4.34	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	42	24	20	14
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	<0.02	0.04	<0.02	0.07
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.06	<0.02	0.05	<0.02	0.14
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.44	0.04	0.87	0.12	1.37
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	<0.02	0.03	<0.02	0.10



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_POT102_20102 1	0958_MW115_201021	0958_MW312_201021	0958_MW311_201021	0958_MW103_201021
Client sampling date / time				21-Oct-2020 13:40	21-Oct-2020 13:56	21-Oct-2020 14:15	21-Oct-2020 14:28	21-Oct-2020 14:46
Compound	CAS Number	LOR	Unit	EP2011490-016	EP2011490-017	EP2011490-018	EP2011490-019	EP2011490-020
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.20	0.04	0.36	0.02	2.02
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.05
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.11	<0.02	0.11	0.03	0.33
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.03
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.02	<0.01	0.03	<0.01	0.10
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_POT102_20102 1	0958_MW115_201021	0958_MW312_201021	0958_MW311_201021	0958_MW103_201021
Client sampling date / time				21-Oct-2020 13:40	21-Oct-2020 13:56	21-Oct-2020 14:15	21-Oct-2020 14:28	21-Oct-2020 14:46
Compound	CAS Number	LOR	Unit	EP2011490-016	EP2011490-017	EP2011490-018	EP2011490-019	EP2011490-020
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.92	0.08	1.49	0.17	4.21
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.64	0.08	1.23	0.14	3.39
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.83	0.08	1.41	0.17	3.97
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	91.3	90.6	93.8	98.5	95.7
13C8-PFOA	----	0.02	%	96.6	101	102	101	98.8



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Client sample ID	0958_MW105_201021	0958_QC401_201021	0958_MW104_201021	----	----
Client sampling date / time					21-Oct-2020 15:20	21-Oct-2020 15:40	21-Oct-2020 14:46	----	----
Compound	CAS Number	LOR	Unit		EP2011490-021	EP2011490-023	EP2011490-024	-----	-----
				Result	Result	Result		----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.28	----	7.47	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		116	----	194	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		6	----	78	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	----	<1	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	----	<1	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		16	----	88	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		16	----	88	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		<2	----	3	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19	----	43	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		2	----	32	----	----
Magnesium	7439-95-4	1	mg/L		1	----	2	----	----
Sodium	7440-23-5	1	mg/L		19	----	24	----	----
Potassium	7440-09-7	1	mg/L		1	----	3	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		0.86	----	3.03	----	----
∅ Total Cations	----	0.01	meq/L		1.03	----	2.88	----	----
∅ Ionic Balance	----	0.01	%		----	----	2.56	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		----	----	7	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		27	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		0.05	<0.02	0.20	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW105_201021	0958_QC401_201021	0958_MW104_201021	----	----
Client sampling date / time				21-Oct-2020 15:20	21-Oct-2020 15:40	21-Oct-2020 14:46	----	----
Compound	CAS Number	LOR	Unit	EP2011490-021	EP2011490-023	EP2011490-024	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.04	<0.01	0.18	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.03	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW105_201021	0958_QC401_201021	0958_MW104_201021	----	----
Client sampling date / time				21-Oct-2020 15:20	21-Oct-2020 15:40	21-Oct-2020 14:46	----	----
Compound	CAS Number	LOR	Unit	EP2011490-021	EP2011490-023	EP2011490-024	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.09	<0.01	0.41	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.09	<0.01	0.38	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.09	<0.01	0.41	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	93.2	92.8	98.8	----	----
13C8-PFOA	----	0.02	%	97.3	99.2	101	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	0958_QC301_201021	----	----	----	----
Client sampling date / time				21-Oct-2020 15:39	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2011490-022	-----	-----	-----	-----	-----
Result				----	----	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	0958_QC301_201021	----	----	----	----
Client sampling date / time					21-Oct-2020 15:39	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2011490-022	-----	-----	-----	-----
				Result		----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05		----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05		----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02		----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02		----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05		----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05		----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05		----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05		----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01		----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01		----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01		----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	99.9		----	----	----	----
13C8-PFOA	----	0.02	%	96.9		----	----	----	----



Surrogate Control Limits

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

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

QUALITY CONTROL REPORT

Work Order	: EP2011490	Page	: 1 of 12
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 21-Oct-2020
Order number	: DEF19009/330	Date Analysis Commenced	: 22-Oct-2020
C-O-C number	: 15116	Issue Date	: 30-Oct-2020
Sampler	: [REDACTED] [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 24		
No. of samples analysed	: 24		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3330165)									
EP2011466-005	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.03	8.04	0.124	0% - 20%
EP2011490-004	0958_MW301_201021	EA005-P: pH Value	----	0.01	pH Unit	3.64	3.63	0.275	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3330168)									
EP2011490-014	0958_MW117_201021	EA005-P: pH Value	----	0.01	pH Unit	6.23	6.14	1.46	0% - 20%
EP2011500-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.46	8.49	0.354	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3329624)									
EP2011490-001	0958_MW102_201021	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	90	91	0.00	No Limit
EP2011490-009	0958_MW122_201021	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	151	148	2.01	0% - 50%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3331955)									
EP2011490-013	0958_MW118_201021	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	114	111	2.23	0% - 50%
EP2011490-021	0958_MW105_201021	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	116	120	3.39	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3329625)									
EP2011490-001	0958_MW102_201021	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	6	22.2	No Limit
EP2011490-011	0958_MW121_201021	EA025H: Suspended Solids (SS)	----	5	mg/L	41	41	0.00	No Limit
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3331956)									
EP2011490-013	0958_MW118_201021	EA025H: Suspended Solids (SS)	----	5	mg/L	18	18	5.56	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3330167)									
EP2011490-004	0958_MW301_201021	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	<1	<1	0.00	No Limit
EP2011490-014	0958_MW117_201021	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	12	11	0.00	0% - 50%

Page : 3 of 12
 Work Order : EP2011490
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFSOMP



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3330167) - continued									
EP2011490-014	0958_MW117_201021	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	12	11	0.00	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3330169)									
EP2011509-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	11	8	34.6	0% - 50%
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	38	36	4.37	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	49	44	10.5	0% - 20%
EP2011500-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	12	14	17.4	0% - 50%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	204	201	1.46	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	216	215	0.00	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3326376)									
EP2011490-001	0958_MW102_201021	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
EP2011490-011	0958_MW121_201021	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3326380)									
EP2011501-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2360	2360	0.387	0% - 20%
EP2011490-021	0958_MW105_201021	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<2	<2	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3326377)									
EP2011490-001	0958_MW102_201021	ED045G: Chloride	16887-00-6	1	mg/L	16	16	0.00	0% - 50%
EP2011490-011	0958_MW121_201021	ED045G: Chloride	16887-00-6	1	mg/L	50	42	17.8	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3326381)									
EP2011501-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	4760	4780	0.524	0% - 20%
EP2011490-021	0958_MW105_201021	ED045G: Chloride	16887-00-6	1	mg/L	19	20	0.00	0% - 50%
ED093F: Dissolved Major Cations (QC Lot: 3325203)									
EP2011490-001	0958_MW102_201021	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	15	15	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EP2011490-011	0958_MW121_201021	ED093F: Calcium	7440-70-2	1	mg/L	10	10	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	32	33	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3325204)									
EP2011490-021	0958_MW105_201021	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	19	20	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
EP2011524-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	<1	<1	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3325204) - continued									
EP2011524-007	Anonymous	ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3323729)									
EP2011227-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	18	18	0.00	0% - 50%
EP2011227-013	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	6	6	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3326367)									
EP2011490-011	0958_MW121_201021	EP002: Dissolved Organic Carbon	----	1	mg/L	15	15	0.00	0% - 50%
EP2011490-024	0958_MW104_201021	EP002: Dissolved Organic Carbon	----	1	mg/L	7	6	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3326366)									
EP2011312-017	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	1650	1680	1.92	0% - 20%
EP2011501-004	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	45	46	0.00	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3329071)									
EP2011517-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.02	0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.02	0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES2037391-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.06	0.06	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.08	32.2	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.28	0.27	0.00	0% - 50%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3329071)									
EP2011517-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		ES2037391-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.07	0.07
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3			0.02	µg/L	0.10	0.10	0.00	No Limit
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4			0.02	µg/L	0.19	0.19	0.00	No Limit
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9			0.02	µg/L	0.08	0.08	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3329071) - continued									
ES2037391-001	Anonymous	EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.02	0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3329071)									
EP2011517-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2037391-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3329071)									
EP2011517-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit

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 Work Order : EP2011490
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3329071) - continued									
EP2011517-001	Anonymous	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2037391-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3329071)									
EP2011517-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.04	0.03	28.6	No Limit
ES2037391-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.90	0.91	1.10	0% - 20%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3330165)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3330168)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3329624)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100.0	88.1	114
				<10	1000 mg/L	100	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3331955)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3329625)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	106	89.1	120
				<5	1000 mg/L	102	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3331956)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	105	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3330167)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3330169)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	107	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3326376)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	97.0	87.7	113
				<1	500 mg/L	112	87.7	113



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3326380)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	94.9	87.7	113
				<1	500 mg/L	108	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3326377)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	101	87.9	114
				<1	1000 mg/L	96.6	87.9	114
ED045G: Chloride by Discrete Analyser (QCLot: 3326381)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.5	87.9	114
				<1	1000 mg/L	93.0	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3325203)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.3	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.5	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.8	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.1	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3325204)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	96.0	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.7	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	94.3	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.2	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3323729)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	105	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3326367)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	104	73.2	116
				<1	100 mg/L	105	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3326366)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	104	87.2	116
				<1	100 mg/L	104	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3326680)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	86.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	94.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	97.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	89.4	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	80.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	82.6	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3329071)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	86.0	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	89.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	88.4	68.0	131



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3329071) - continued								
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	94.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	90.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	111	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3326680)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	89.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	94.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	95.2	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	89.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	90.0	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	80.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	85.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	89.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	92.6	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	80.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	96.1	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3329071)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	88.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	99.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	95.6	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	102	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	99.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	99.8	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	84.5	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3326680)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	95.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	78.3	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	110	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	77.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	85.2	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	91.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	90.2	61.0	135



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3329071)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	93.6	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	97.1	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	98.8	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	98.7	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	91.7	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	108	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	97.6	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3326680)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	80.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	95.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	82.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	108	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3329071)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	99.6	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	102	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	99.4	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	96.6	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
					MS	Low	High
Client sample ID	Method: Compound	CAS Number					
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3326376)							
EP2011490-001	0958_MW102_201021	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	106	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3326380)							
EP2011466-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	117	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3326377)							
EP2011490-001	0958_MW102_201021	ED045G: Chloride	16887-00-6	1000 mg/L	102	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3326381)							
EP2011490-021	0958_MW105_201021	ED045G: Chloride	16887-00-6	1000 mg/L	103	70.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3323729)							
EP2011227-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	106	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3326367)							
EP2011490-012	0958_MW120_201021	EP002: Dissolved Organic Carbon	----	100 mg/L	107	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3326366)							
EP2011312-018	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	# Not Determined	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3329071)							
EP2011517-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	86.5	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	95.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	93.3	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	97.1	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	93.3	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	118	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3329071)							
EP2011517-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	90.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	108	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	102	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	99.4	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	100	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.7	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	101	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	109	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	112	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	81.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3329071)							
EP2011517-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	98.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	90.3	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	97.8	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	92.3	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	94.9	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	94.4	61.0	135



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3329071)							
EP2011517-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	100	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	100	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	94.0	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	113	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2011490	Page	: 1 of 12
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 21-Oct-2020
Site	: DEF19009/Gingin	Issue Date	: 30-Oct-2020
Sampler	: [REDACTED] [REDACTED]	No. of samples received	: 24
Order number	: DEF19009/330	No. of samples analysed	: 24

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

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Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP005: Total Organic Carbon (TOC)	EP2011312--018	Anonymous	Total Organic Carbon	----	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW102_201021,	0958_MW302_201021,	----	----	----	27-Oct-2020	21-Oct-2020	6
0958_MW303_201021,	0958_MW301_201021,						
0958_MW112_201021,	0958_MW113_201021,						
0958_MW109_201021,	0958_MW110_201021,						
0958_MW122_201021,	0958_MW124_201021,						
0958_MW121_201021,	0958_MW120_201021,						
0958_MW118_201021,	0958_MW117_201021,						
0958_MW116_201021,	0958_POT102_201021,						
0958_MW115_201021,	0958_MW312_201021,						
0958_MW311_201021,	0958_MW103_201021,						
0958_MW105_201021,	0958_MW104_201021						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	35	5.71	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	35	2.86	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)		21-Oct-2020	----	----	----	27-Oct-2020	21-Oct-2020	✖
0958_MW102_201021,	0958_MW302_201021,							
0958_MW303_201021,	0958_MW301_201021,							
0958_MW112_201021,	0958_MW113_201021,							
0958_MW109_201021,	0958_MW110_201021,							
0958_MW122_201021,	0958_MW124_201021,							
0958_MW121_201021,	0958_MW120_201021,							
0958_MW118_201021,	0958_MW117_201021,							
0958_MW116_201021,	0958_POT102_201021,							
0958_MW115_201021,	0958_MW312_201021,							
0958_MW311_201021,	0958_MW103_201021,							
0958_MW105_201021,	0958_MW104_201021							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)		21-Oct-2020	----	----	----	27-Oct-2020	28-Oct-2020	✔
0958_MW102_201021,	0958_MW302_201021,							
0958_MW303_201021,	0958_MW301_201021,							
0958_MW112_201021,	0958_MW113_201021,							
0958_MW109_201021,	0958_MW110_201021,							
0958_MW122_201021,	0958_MW124_201021,							
0958_MW121_201021,	0958_MW120_201021							
Clear Plastic Bottle - Natural (EA015H)		21-Oct-2020	----	----	----	28-Oct-2020	28-Oct-2020	✔
0958_MW118_201021,	0958_MW117_201021,							
0958_MW116_201021,	0958_POT102_201021,							
0958_MW115_201021,	0958_MW312_201021,							
0958_MW311_201021,	0958_MW103_201021,							
0958_MW105_201021,	0958_MW104_201021							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		21-Oct-2020	----	----	----	27-Oct-2020	28-Oct-2020	✔
0958_MW102_201021,	0958_MW302_201021,							
0958_MW303_201021,	0958_MW301_201021,							
0958_MW112_201021,	0958_MW113_201021,							
0958_MW109_201021,	0958_MW110_201021,							
0958_MW122_201021,	0958_MW124_201021,							
0958_MW121_201021,	0958_MW120_201021							
Clear Plastic Bottle - Natural (EA025H)		21-Oct-2020	----	----	----	28-Oct-2020	28-Oct-2020	✔
0958_MW118_201021,	0958_MW117_201021,							
0958_MW116_201021,	0958_POT102_201021,							
0958_MW115_201021,	0958_MW312_201021,							
0958_MW311_201021,	0958_MW103_201021,							
0958_MW105_201021,	0958_MW104_201021							

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Matrix: **WATER**

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

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0958_MW102_201021, 0958_MW303_201021, 0958_MW112_201021, 0958_MW109_201021, 0958_MW122_201021, 0958_MW121_201021, 0958_MW118_201021, 0958_MW116_201021, 0958_MW115_201021, 0958_MW311_201021, 0958_MW105_201021,	0958_MW302_201021, 0958_MW301_201021, 0958_MW113_201021, 0958_MW110_201021, 0958_MW124_201021, 0958_MW120_201021, 0958_MW117_201021, 0958_POT102_201021, 0958_MW312_201021, 0958_MW103_201021, 0958_MW104_201021	21-Oct-2020	----	----	----	27-Oct-2020	04-Nov-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0958_MW102_201021, 0958_MW303_201021, 0958_MW112_201021, 0958_MW109_201021, 0958_MW122_201021, 0958_MW121_201021, 0958_MW118_201021, 0958_MW116_201021, 0958_MW115_201021, 0958_MW311_201021, 0958_MW105_201021,	0958_MW302_201021, 0958_MW301_201021, 0958_MW113_201021, 0958_MW110_201021, 0958_MW124_201021, 0958_MW120_201021, 0958_MW117_201021, 0958_POT102_201021, 0958_MW312_201021, 0958_MW103_201021, 0958_MW104_201021	21-Oct-2020	----	----	----	30-Oct-2020	18-Nov-2020	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0958_MW102_201021, 0958_MW303_201021, 0958_MW112_201021, 0958_MW109_201021, 0958_MW122_201021, 0958_MW121_201021, 0958_MW118_201021, 0958_MW116_201021, 0958_MW115_201021, 0958_MW311_201021, 0958_MW105_201021,	0958_MW302_201021, 0958_MW301_201021, 0958_MW113_201021, 0958_MW110_201021, 0958_MW124_201021, 0958_MW120_201021, 0958_MW117_201021, 0958_POT102_201021, 0958_MW312_201021, 0958_MW103_201021, 0958_MW104_201021	21-Oct-2020	----	----	----	30-Oct-2020	18-Nov-2020	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0958_MW102_201021, 0958_MW303_201021, 0958_MW112_201021, 0958_MW109_201021, 0958_MW122_201021, 0958_MW121_201021, 0958_MW118_201021, 0958_MW116_201021, 0958_MW115_201021, 0958_MW311_201021, 0958_MW105_201021,	0958_MW302_201021, 0958_MW301_201021, 0958_MW113_201021, 0958_MW110_201021, 0958_MW124_201021, 0958_MW120_201021, 0958_MW117_201021, 0958_POT102_201021, 0958_MW312_201021, 0958_MW103_201021, 0958_MW104_201021	21-Oct-2020	----	----	----	23-Oct-2020	28-Oct-2020	✔
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0958_MW102_201021, 0958_MW303_201021, 0958_MW112_201021, 0958_MW109_201021, 0958_MW122_201021	0958_MW302_201021, 0958_MW301_201021, 0958_MW113_201021, 0958_MW110_201021,	21-Oct-2020	----	----	----	22-Oct-2020	18-Nov-2020	✔
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0958_MW121_201021, 0958_MW118_201021, 0958_MW116_201021, 0958_MW115_201021, 0958_MW311_201021, 0958_MW104_201021	0958_MW120_201021, 0958_MW117_201021, 0958_POT102_201021, 0958_MW312_201021, 0958_MW103_201021,	21-Oct-2020	----	----	----	23-Oct-2020	18-Nov-2020	✔
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0958_MW124_201021,	0958_MW105_201021	21-Oct-2020	----	----	----	23-Oct-2020	18-Nov-2020	✔

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		21-Oct-2020	26-Oct-2020	19-Apr-2021	✓	27-Oct-2020	19-Apr-2021	✓
0958_MW113_201021,	0958_MW109_201021,							
0958_MW110_201021,	0958_MW122_201021,							
0958_MW124_201021,	0958_MW121_201021,							
0958_MW120_201021,	0958_MW118_201021,							
0958_MW117_201021,	0958_MW116_201021,							
0958_POT102_201021,	0958_MW115_201021,							
0958_MW312_201021,	0958_MW311_201021,							
0958_MW103_201021,	0958_MW105_201021,							
0958_QC301_201021,	0958_QC401_201021,							
0958_MW104_201021								
HDPE (no PTFE) (EP231X)		21-Oct-2020	27-Oct-2020	19-Apr-2021	✓	28-Oct-2020	19-Apr-2021	✓
0958_MW102_201021,	0958_MW302_201021,							
0958_MW303_201021,	0958_MW301_201021,							
0958_MW112_201021								
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		21-Oct-2020	26-Oct-2020	19-Apr-2021	✓	27-Oct-2020	19-Apr-2021	✓
0958_MW113_201021,	0958_MW109_201021,							
0958_MW110_201021,	0958_MW122_201021,							
0958_MW124_201021,	0958_MW121_201021,							
0958_MW120_201021,	0958_MW118_201021,							
0958_MW117_201021,	0958_MW116_201021,							
0958_POT102_201021,	0958_MW115_201021,							
0958_MW312_201021,	0958_MW311_201021,							
0958_MW103_201021,	0958_MW105_201021,							
0958_QC301_201021,	0958_QC401_201021,							
0958_MW104_201021								
HDPE (no PTFE) (EP231X)		21-Oct-2020	27-Oct-2020	19-Apr-2021	✓	28-Oct-2020	19-Apr-2021	✓
0958_MW102_201021,	0958_MW302_201021,							
0958_MW303_201021,	0958_MW301_201021,							
0958_MW112_201021								

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Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		21-Oct-2020	26-Oct-2020	19-Apr-2021	✔	27-Oct-2020	19-Apr-2021	✔
0958_MW113_201021,	0958_MW109_201021,							
0958_MW110_201021,	0958_MW122_201021,							
0958_MW124_201021,	0958_MW121_201021,							
0958_MW120_201021,	0958_MW118_201021,							
0958_MW117_201021,	0958_MW116_201021,							
0958_POT102_201021,	0958_MW115_201021,							
0958_MW312_201021,	0958_MW311_201021,							
0958_MW103_201021,	0958_MW105_201021,							
0958_QC301_201021,	0958_QC401_201021,							
0958_MW104_201021								
HDPE (no PTFE) (EP231X)		21-Oct-2020	27-Oct-2020	19-Apr-2021	✔	28-Oct-2020	19-Apr-2021	✔
0958_MW102_201021,	0958_MW302_201021,							
0958_MW303_201021,	0958_MW301_201021,							
0958_MW112_201021								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		21-Oct-2020	26-Oct-2020	19-Apr-2021	✔	27-Oct-2020	19-Apr-2021	✔
0958_MW113_201021,	0958_MW109_201021,							
0958_MW110_201021,	0958_MW122_201021,							
0958_MW124_201021,	0958_MW121_201021,							
0958_MW120_201021,	0958_MW118_201021,							
0958_MW117_201021,	0958_MW116_201021,							
0958_POT102_201021,	0958_MW115_201021,							
0958_MW312_201021,	0958_MW311_201021,							
0958_MW103_201021,	0958_MW105_201021,							
0958_QC301_201021,	0958_QC401_201021,							
0958_MW104_201021								
HDPE (no PTFE) (EP231X)		21-Oct-2020	27-Oct-2020	19-Apr-2021	✔	28-Oct-2020	19-Apr-2021	✔
0958_MW102_201021,	0958_MW302_201021,							
0958_MW303_201021,	0958_MW301_201021,							
0958_MW112_201021								

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Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0958_MW113_201021, 0958_MW110_201021, 0958_MW124_201021, 0958_MW120_201021, 0958_MW117_201021, 0958_POT102_201021, 0958_MW312_201021, 0958_MW103_201021, 0958_QC301_201021, 0958_MW104_201021	0958_MW109_201021, 0958_MW122_201021, 0958_MW121_201021, 0958_MW118_201021, 0958_MW116_201021, 0958_MW115_201021, 0958_MW311_201021, 0958_MW105_201021, 0958_QC401_201021,	21-Oct-2020	26-Oct-2020	19-Apr-2021	✔	27-Oct-2020	19-Apr-2021	✔
HDPE (no PTFE) (EP231X)								
0958_MW102_201021, 0958_MW303_201021, 0958_MW112_201021	0958_MW302_201021, 0958_MW301_201021,	21-Oct-2020	27-Oct-2020	19-Apr-2021	✔	28-Oct-2020	19-Apr-2021	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	33	12.12	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	29	10.34	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	36	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	33	12.12	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	29	13.79	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	36	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	29	6.90	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	36	5.56	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	35	2.86	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	16	6.25	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



Environmental Division
Perth

Work Order Reference
EP2011633



Telephone : + 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: DEF9009 Client: CARDNO Project Manager: [REDACTED]
ALS Compass COC Reference: 1876 # Samples: Sampler: [REDACTED]
Turnaround Requirements: Standard Urgent Phone: [REDACTED]

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

Custody	[REDACTED]	Received by:	Relinquished by:	Received by:
Relinquished				[REDACTED]
Date / Time:		Date / Time:	Date / Time:	Date / Time:
				23/10/20 1705



CHAIN OF CUSTODY

COC#: 15176 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW140		23/10/2020 08:54 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_MW139		23/10/2020 09:05 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0958_MW138		23/10/2020 09:18 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_MW135		23/10/2020 09:57 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_MW136		23/10/2020 10:12 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0958_MW134		23/10/2020 10:39 AM	Water	ALS: 4 Non ALS: 0	No	X			
007	0958_MW133		23/10/2020 11:05 AM	Water	ALS: 4 Non ALS: 0	No	X			
008	0958_MW132		23/10/2020 11:17 AM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_MW131		23/10/2020 11:29 AM	Water	ALS: 4 Non ALS: 0	No	X			



CHAIN OF CUSTODY

ALS COC#: 15176 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER: [REDACTED]

PRIMARY SAMPLER: [REDACTED]

EMAIL REPORTS TO: [REDACTED]

EMAIL INVOICES TO: [REDACTED]

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH: [REDACTED]

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_MW106		23/10/2020 01:37 PM	Water	ALS: 4 Non ALS: 0	No	X			
011	0958_MW128		23/10/2020 01:39 PM	Water	ALS: 4 Non ALS: 0	No	X			
012	0958_MW134		23/10/2020 01:41 PM	Water	ALS: 4 Non ALS: 0	No	X			
013	0958_MW129		23/10/2020 01:42 PM	Water	ALS: 4 Non ALS: 0	No	X			
014	0958_MW126		23/10/2020 01:44 PM	Water	ALS: 4 Non ALS: 0	No	X			
015	0958_MW125		23/10/2020 01:45 PM	Water	ALS: 4 Non ALS: 0	No	X			
016	0958_MW137		23/10/2020 03:20 PM	Water	ALS: 4 Non ALS: 0	No	X			
017	0958_MW141		23/10/2020 03:57 PM	Water	ALS: 4 Non ALS: 0	No	X			
018	0958_QC301		23/10/2020 03:59 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

COC#: 15176

ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
019	0958_QC401		23/10/2020 04:00 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

ALS COC#: 15176 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSASOMP

SITE: SPM DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW140	Clear Plastic Bottle - Natural	250 mL	00070719062450	Green	No	
001	0958_MW140	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023906	Purple	No	
001	0958_MW140	HDPE (no PTFE)	20 mL	00352005006451	Grey	No	
001	0958_MW140	HDPE (no PTFE)	20 mL	00352005006533	Grey	No	
002	0958_MW139	Clear Plastic Bottle - Natural	250 mL	00070719062405	Green	No	
002	0958_MW139	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058030	Purple	No	
002	0958_MW139	HDPE (no PTFE)	20 mL	00352005006419	Grey	No	
002	0958_MW139	HDPE (no PTFE)	20 mL	00352005006505	Grey	No	
003	0958_MW138	Clear Plastic Bottle - Natural	250 mL	00070719062514	Green	No	
003	0958_MW138	HDPE (no PTFE)	20 mL	00352005006395	Grey	No	
003	0958_MW138	HDPE (no PTFE)	20 mL	00352005006377	Grey	No	
003	0958_MW138	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058375	Purple	No	
004	0958_MW135	Clear Plastic Bottle - Natural	250 mL	00070719062363	Green	No	
004	0958_MW135	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058079	Purple	No	
004	0958_MW135	HDPE (no PTFE)	20 mL	00352005006325	Grey	No	
004	0958_MW135	HDPE (no PTFE)	20 mL	00352005006289	Grey	No	
005	0958_MW136	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220057982	Purple	No	
005	0958_MW136	Clear Plastic Bottle - Natural	250 mL	00070719062447	Green	No	
005	0958_MW136	HDPE (no PTFE)	20 mL	00352005006271	Grey	No	
005	0958_MW136	HDPE (no PTFE)	20 mL	00352005005080	Grey	No	
006	0958_MW134	Clear Plastic Bottle - Natural	250 mL	00070719062433	Green	No	
006	0958_MW134	HDPE (no PTFE)	20 mL	00352005006525	Grey	No	
006	0958_MW134	HDPE (no PTFE)	20 mL	00352005005223	Grey	No	
006	0958_MW134	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058045	Purple	No	
007	0958_MW133	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058380	Purple	No	
007	0958_MW133	Clear Plastic Bottle - Natural	250 mL	00070719062372	Green	No	



014	0958_MW126	HDPE (no PTFE)	20 mL	00352005005269	Grey	No	
014	0958_MW126	HDPE (no PTFE)	20 mL	00352005005077	Grey	No	
014	0958_MW126	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058097	Purple	No	
015	0958_MW125	Clear Plastic Bottle - Natural	250 mL	00071119091231	Green	No	
015	0958_MW125	HDPE (no PTFE)	20 mL	00352005006771	Grey	No	
015	0958_MW125	HDPE (no PTFE)	20 mL	00352005006573	Grey	No	
015	0958_MW125	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023677	Purple	No	
016	0958_MW137	Clear Plastic Bottle - Natural	250 mL	00070719062416	Green	No	
016	0958_MW137	HDPE (no PTFE)	20 mL	00352005006416	Grey	No	
016	0958_MW137	HDPE (no PTFE)	20 mL	00352005006310	Grey	No	
016	0958_MW137	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058084	Purple	No	
017	0958_MW141	Clear Plastic Bottle - Natural	250 mL	00070719062497	Green	No	
017	0958_MW141	HDPE (no PTFE)	20 mL	00352005006515	Grey	No	
017	0958_MW141	HDPE (no PTFE)	20 mL	00352005006278	Grey	No	
017	0958_MW141	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058314	Purple	No	
018	0958_QC301	HDPE (no PTFE)	20 mL	00350019177500	Grey	No	
018	0958_QC301	HDPE (no PTFE)	20 mL	00350019177585	Grey	No	
019	0958_QC401	HDPE (no PTFE)	20 mL	00350019018089	Grey	No	
019	0958_QC401	HDPE (no PTFE)	20 mL	00350019012144	Grey	No	

8:25:48 AM

CERTIFICATE OF ANALYSIS

Work Order : **EP2011633**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 15176
Sampler : [REDACTED] [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 19
No. of samples analysed : 19

Page : 1 of 17
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 23-Oct-2020 17:05
Date Analysis Commenced : 27-Oct-2020
Issue Date : 04-Nov-2020 20:48



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high for sample #10 and #16 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW140_201023	0958_MW139_201023	0958_MW138_201023	0958_MW135_201023	0958_MW136_201023
Client sampling date / time				23-Oct-2020 08:54	23-Oct-2020 09:05	23-Oct-2020 09:18	23-Oct-2020 09:57	23-Oct-2020 10:12
Compound	CAS Number	LOR	Unit	EP2011633-001	EP2011633-002	EP2011633-003	EP2011633-004	EP2011633-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.93	6.30	4.27	6.28	6.43
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	254	103	312	113	102
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	18	43	65	217	16
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	171	15	<1	11	10
Total Alkalinity as CaCO ₃	----	1	mg/L	171	15	<1	11	10
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	<1	1	43	13	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	39	52	77	40	42
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	66	<1	3	1	2
Magnesium	7439-95-4	1	mg/L	3	3	8	4	3
Sodium	7440-23-5	1	mg/L	24	28	50	30	28
Potassium	7440-09-7	1	mg/L	4	2	3	1	2
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	4.52	1.79	3.07	1.62	1.38
∅ Total Cations	----	0.01	meq/L	4.69	1.52	3.06	1.71	1.62
∅ Ionic Balance	----	0.01	%	1.84	----	0.12	2.73	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	7	6	76	9	9
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.09	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW140_201023	0958_MW139_201023	0958_MW138_201023	0958_MW135_201023	0958_MW136_201023
Client sampling date / time				23-Oct-2020 08:54	23-Oct-2020 09:05	23-Oct-2020 09:18	23-Oct-2020 09:57	23-Oct-2020 10:12
Compound	CAS Number	LOR	Unit	EP2011633-001	EP2011633-002	EP2011633-003	EP2011633-004	EP2011633-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.18	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW140_201023	0958_MW139_201023	0958_MW138_201023	0958_MW135_201023	0958_MW136_201023
Client sampling date / time				23-Oct-2020 08:54	23-Oct-2020 09:05	23-Oct-2020 09:18	23-Oct-2020 09:57	23-Oct-2020 10:12
Compound	CAS Number	LOR	Unit	EP2011633-001	EP2011633-002	EP2011633-003	EP2011633-004	EP2011633-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.27	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.27	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.27	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	102	106	108	106	103
13C8-PFOA	----	0.02	%	108	113	110	112	109



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW134_201023	0958_MW133_201023	0958_MW132_201023	0958_MW131_201023	0958_MW106_201023
Client sampling date / time				23-Oct-2020 10:39	23-Oct-2020 11:05	23-Oct-2020 11:17	23-Oct-2020 11:29	23-Oct-2020 13:37
Compound	CAS Number	LOR	Unit	EP2011633-006	EP2011633-007	EP2011633-008	EP2011633-009	EP2011633-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.54	6.27	6.66	6.40	3.39
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	102	69	106	90	220
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	14	101	28	153	410
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	13	9	27	29	<1
Total Alkalinity as CaCO ₃	----	1	mg/L	13	9	27	29	<1
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	3	19
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	44	25	44	23	30
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	<1	4	<1	<1
Magnesium	7439-95-4	1	mg/L	3	1	4	2	3
Sodium	7440-23-5	1	mg/L	28	19	28	26	17
Potassium	7440-09-7	1	mg/L	3	<1	3	<1	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.50	0.88	1.78	1.29	1.24
∅ Total Cations	----	0.01	meq/L	1.64	0.91	1.82	1.30	0.99
∅ Ionic Balance	----	0.01	%	4.47	1.32	1.19	0.19	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	10	13	9	15	66
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.03	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW134_201023	0958_MW133_201023	0958_MW132_201023	0958_MW131_201023	0958_MW106_201023
Client sampling date / time				23-Oct-2020 10:39	23-Oct-2020 11:05	23-Oct-2020 11:17	23-Oct-2020 11:29	23-Oct-2020 13:37
Compound	CAS Number	LOR	Unit	EP2011633-006	EP2011633-007	EP2011633-008	EP2011633-009	EP2011633-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW134_201023	0958_MW133_201023	0958_MW132_201023	0958_MW131_201023	0958_MW106_201023
Client sampling date / time				23-Oct-2020 10:39	23-Oct-2020 11:05	23-Oct-2020 11:17	23-Oct-2020 11:29	23-Oct-2020 13:37
Compound	CAS Number	LOR	Unit	EP2011633-006	EP2011633-007	EP2011633-008	EP2011633-009	EP2011633-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	0.03	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.03	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	0.03	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	101	102	98.2	105	99.8
13C8-PFOA	----	0.02	%	102	106	106	107	102



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW128_201023	0958_MW134_201023	0958_MW129_201023	0958_MW126_201023	0958_MW125_201023
Client sampling date / time				23-Oct-2020 13:39	23-Oct-2020 13:41	23-Oct-2020 13:42	23-Oct-2020 13:44	23-Oct-2020 13:45
Compound	CAS Number	LOR	Unit	EP2011633-011	EP2011633-012	EP2011633-013	EP2011633-014	EP2011633-015
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.00	6.70	6.10	6.56	6.37
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	127	134	144	105	121
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	179	83	163	11	108
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	7	26	8	18	7
Total Alkalinity as CaCO ₃	----	1	mg/L	7	26	8	18	7
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	9	1	<1	<1	7
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	42	44	53	44	18
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	8	<1	<1	<1
Magnesium	7439-95-4	1	mg/L	3	3	3	3	3
Sodium	7440-23-5	1	mg/L	31	26	29	28	14
Potassium	7440-09-7	1	mg/L	1	5	2	3	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.51	1.78	1.65	1.60	0.79
∅ Total Cations	----	0.01	meq/L	1.62	1.90	1.56	1.54	0.86
∅ Ionic Balance	----	0.01	%	3.48	3.35	2.97	1.88	3.79
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	14	7	9	6	16
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW128_201023	0958_MW134_201023	0958_MW129_201023	0958_MW126_201023	0958_MW125_201023
Client sampling date / time				23-Oct-2020 13:39	23-Oct-2020 13:41	23-Oct-2020 13:42	23-Oct-2020 13:44	23-Oct-2020 13:45
Compound	CAS Number	LOR	Unit	EP2011633-011	EP2011633-012	EP2011633-013	EP2011633-014	EP2011633-015
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW128_201023	0958_MW134_201023	0958_MW129_201023	0958_MW126_201023	0958_MW125_201023
Client sampling date / time				23-Oct-2020 13:39	23-Oct-2020 13:41	23-Oct-2020 13:42	23-Oct-2020 13:44	23-Oct-2020 13:45
Compound	CAS Number	LOR	Unit	EP2011633-011	EP2011633-012	EP2011633-013	EP2011633-014	EP2011633-015
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	101	97.1	106	92.5	97.4
13C8-PFOA	----	0.02	%	104	104	105	102	100



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW137_201023	0958_MW141_201023	0958_QC301_201023	----	----
Client sampling date / time				23-Oct-2020 15:20	23-Oct-2020 15:57	23-Oct-2020 15:59	----	----
Compound	CAS Number	LOR	Unit	EP2011633-016	EP2011633-017	EP2011633-018	-----	-----
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	4.57	5.20	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	194	126	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	430	36	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	<1	<1	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	<1	<1	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	19	6	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	20	53	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	8	<1	----	----	----
Magnesium	7439-95-4	1	mg/L	6	3	----	----	----
Sodium	7440-23-5	1	mg/L	14	30	----	----	----
Potassium	7440-09-7	1	mg/L	15	1	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	0.96	1.62	----	----	----
∅ Total Cations	----	0.01	meq/L	1.88	1.58	----	----	----
∅ Ionic Balance	----	0.01	%	----	1.33	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	31	13	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.04	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.03	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.34	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW137_201023	0958_MW141_201023	0958_QC301_201023	----	----
Client sampling date / time				23-Oct-2020 15:20	23-Oct-2020 15:57	23-Oct-2020 15:59	----	----
Compound	CAS Number	LOR	Unit	EP2011633-016	EP2011633-017	EP2011633-018	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.02	0.08	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.08	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.02	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW137_201023	0958_MW141_201023	0958_QC301_201023	----	----
Client sampling date / time				23-Oct-2020 15:20	23-Oct-2020 15:57	23-Oct-2020 15:59	----	----
Compound	CAS Number	LOR	Unit	EP2011633-016	EP2011633-017	EP2011633-018	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.02	0.59	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.02	0.42	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.02	0.56	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	103	104	97.9	----	----
13C8-PFOA	----	0.02	%	105	105	98.7	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

0958_QC401_201023

Client sampling date / time

23-Oct-2020 16:00

Compound	CAS Number	LOR	Unit	EP2011633-019	Result			
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EP231A: Perfluoroalkyl Sulfonic Acids

Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	0958_QC401_201023	----	----	----	----
Client sampling date / time					23-Oct-2020 16:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2011633-019	-----	-----	-----	-----
				Result		----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05		----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05		----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02		----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02		----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05		----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05		----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05		----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05		----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01		----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01		----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01		----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	97.1		----	----	----	----
13C8-PFOA	----	0.02	%	102		----	----	----	----



Surrogate Control Limits

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

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

QUALITY CONTROL REPORT

Work Order	: EP2011633	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 23-Oct-2020
Order number	: DEF19009/330	Date Analysis Commenced	: 27-Oct-2020
C-O-C number	: 15176	Issue Date	: 04-Nov-2020
Sampler	: [REDACTED] [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 19		
No. of samples analysed	: 19		



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3337509)									
EP2011616-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	3.94	3.92	0.509	0% - 20%
EP2011633-010	0958_MW106_201023	EA005-P: pH Value	----	0.01	pH Unit	3.39	3.39	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3334336)									
EP2011633-001	0958_MW140_201023	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	254	250	1.79	0% - 20%
EP2011633-009	0958_MW131_201023	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	90	90	0.00	No Limit
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3336713)									
EP2011605-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	251	253	0.794	0% - 20%
EP2011633-016	0958_MW137_201023	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	194	192	1.04	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3334337)									
EP2011633-001	0958_MW140_201023	EA025H: Suspended Solids (SS)	----	5	mg/L	18	18	0.00	No Limit
EP2011716-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	30	32	6.45	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3336714)									
EP2011627-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	91	98	7.15	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3337508)									
EP2011616-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.00	No Limit
EP2011633-010	0958_MW106_201023	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3337510)									
EP2011679-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit

Page : 3 of 6
 Work Order : EP2011633
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFSOMP



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3337510) - continued									
EP2011679-006	Anonymous	ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	188	190	1.27	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	188	190	1.27	0% - 20%
EP2011649-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	226	224	0.849	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	226	224	0.849	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3328864)									
EP2011633-001	0958_MW140_201023	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
EP2011633-011	0958_MW128_201023	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	9	9	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3328865)									
EP2011633-001	0958_MW140_201023	ED045G: Chloride	16887-00-6	1	mg/L	39	39	0.00	0% - 20%
EP2011633-011	0958_MW128_201023	ED045G: Chloride	16887-00-6	1	mg/L	42	42	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3330069)									
EP2011633-001	0958_MW140_201023	ED093F: Calcium	7440-70-2	1	mg/L	66	66	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	3	3	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	24	24	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.00	No Limit
EP2011633-011	0958_MW128_201023	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	3	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	31	30	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3330633)									
EP2011542-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	6	6	0.00	No Limit
EP2011560-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	43	43	0.00	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3330642)									
EP2011633-007	0958_MW133_201023	EP002: Dissolved Organic Carbon	----	1	mg/L	13	13	0.00	0% - 50%
EP2011633-017	0958_MW141_201023	EP002: Dissolved Organic Carbon	----	1	mg/L	13	13	0.00	0% - 50%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3337509)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3334336)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3336713)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3334337)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	109	89.1	120
				<5	1000 mg/L	102	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3336714)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3337508)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	111	81.2	126
				<1	200 mg/L	99.4	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3337510)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	99.3	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3328864)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	96.4	87.7	113
				<1	500 mg/L	106	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3328865)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	101	87.9	114
				<1	1000 mg/L	99.0	87.9	114



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
ED093F: Dissolved Major Cations (QCLot: 3330069)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	104	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.0	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3330633)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	105	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3330642)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	107	73.2	116
				<1	100 mg/L	106	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3338633)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	93.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	84.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	84.4	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	88.0	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	95.8	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	94.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3338633)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	92.1	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	81.2	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	83.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	94.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	106	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	92.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	94.0	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	78.8	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	82.3	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3338633)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	76.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	92.6	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	96.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	87.6	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	92.3	57.6	145



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3338633) - continued								
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	86.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	84.2	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3338633)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	98.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	84.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	87.4	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	93.0	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%)	Recovery Limits (%)	
					MS	Low	High
Client sample ID	Method: Compound	CAS Number					
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3328864)							
EP2011633-001	0958_MW140_201023	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	108	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3328865)							
EP2011633-001	0958_MW140_201023	ED045G: Chloride	16887-00-6	1000 mg/L	107	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3330633)							
EP2011545-001	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3330642)							
EP2011633-008	0958_MW132_201023	EP002: Dissolved Organic Carbon	----	100 mg/L	105	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2011633	Page	: 1 of 10
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 23-Oct-2020
Site	: DEF19009/Gingin	Issue Date	: 04-Nov-2020
Sampler	: [REDACTED] [REDACTED]	No. of samples received	: 19
Order number	: DEF19009/330	No. of samples analysed	: 19

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Matrix: WATER

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW140_201023,	0958_MW139_201023,	----	----	----	30-Oct-2020	23-Oct-2020	7
0958_MW138_201023,	0958_MW135_201023,						
0958_MW136_201023,	0958_MW134_201023,						
0958_MW133_201023,	0958_MW132_201023,						
0958_MW131_201023,	0958_MW106_201023,						
0958_MW128_201023,	0958_MW134_201023,						
0958_MW129_201023,	0958_MW126_201023,						
0958_MW125_201023,	0958_MW137_201023,						
0958_MW141_201023							

Matrix: WATER

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

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

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

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

Matrix: WATER

Evaluation: ✖ = Holding time breach : ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Page : 3 of 10
 Work Order : EP2011633
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023, 0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023, 0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	23-Oct-2020	----	----	----	30-Oct-2020	23-Oct-2020	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023,	23-Oct-2020	----	----	----	29-Oct-2020	30-Oct-2020	✔
Clear Plastic Bottle - Natural (EA015H)								
0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	23-Oct-2020	----	----	----	30-Oct-2020	30-Oct-2020	✔
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023,	23-Oct-2020	----	----	----	29-Oct-2020	30-Oct-2020	✔
Clear Plastic Bottle - Natural (EA025H)								
0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	23-Oct-2020	----	----	----	30-Oct-2020	30-Oct-2020	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis				
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation		
ED037P: Alkalinity by PC Titrator									
Clear Plastic Bottle - Natural (ED037-P)	0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023, 0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023, 0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	23-Oct-2020	----	----	----	30-Oct-2020	06-Nov-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Clear Plastic Bottle - Natural (ED041G)	0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023, 0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023, 0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	23-Oct-2020	----	----	----	02-Nov-2020	20-Nov-2020	✓
ED045G: Chloride by Discrete Analyser									
Clear Plastic Bottle - Natural (ED045G)	0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023, 0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023, 0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	23-Oct-2020	----	----	----	02-Nov-2020	20-Nov-2020	✓



Matrix: **WATER**

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

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023, 0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023, 0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	23-Oct-2020	----	----	----	28-Oct-2020	30-Oct-2020	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023, 0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023, 0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023,	23-Oct-2020	----	----	----	27-Oct-2020	20-Nov-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0958_MW140_201023, 0958_MW138_201023, 0958_MW136_201023, 0958_MW133_201023, 0958_MW131_201023, 0958_MW128_201023, 0958_MW129_201023, 0958_MW125_201023, 0958_MW141_201023, 0958_QC401_201023	0958_MW139_201023, 0958_MW135_201023, 0958_MW134_201023, 0958_MW132_201023, 0958_MW106_201023, 0958_MW134_201023, 0958_MW126_201023, 0958_MW137_201023, 0958_QC301_201023,	23-Oct-2020	02-Nov-2020	21-Apr-2021	✓	03-Nov-2020	21-Apr-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0958_MW140_201023,	0958_MW139_201023,	23-Oct-2020	02-Nov-2020	21-Apr-2021	✓	03-Nov-2020	21-Apr-2021	✓
0958_MW138_201023,	0958_MW135_201023,							
0958_MW136_201023,	0958_MW134_201023,							
0958_MW133_201023,	0958_MW132_201023,							
0958_MW131_201023,	0958_MW106_201023,							
0958_MW128_201023,	0958_MW134_201023,							
0958_MW129_201023,	0958_MW126_201023,							
0958_MW125_201023,	0958_MW137_201023,							
0958_MW141_201023,	0958_QC301_201023,							
0958_QC401_201023								
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0958_MW140_201023,	0958_MW139_201023,	23-Oct-2020	02-Nov-2020	21-Apr-2021	✓	03-Nov-2020	21-Apr-2021	✓
0958_MW138_201023,	0958_MW135_201023,							
0958_MW136_201023,	0958_MW134_201023,							
0958_MW133_201023,	0958_MW132_201023,							
0958_MW131_201023,	0958_MW106_201023,							
0958_MW128_201023,	0958_MW134_201023,							
0958_MW129_201023,	0958_MW126_201023,							
0958_MW125_201023,	0958_MW137_201023,							
0958_MW141_201023,	0958_QC301_201023,							
0958_QC401_201023								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0958_MW140_201023,	0958_MW139_201023,	23-Oct-2020	02-Nov-2020	21-Apr-2021	✓	03-Nov-2020	21-Apr-2021	✓
0958_MW138_201023,	0958_MW135_201023,							
0958_MW136_201023,	0958_MW134_201023,							
0958_MW133_201023,	0958_MW132_201023,							
0958_MW131_201023,	0958_MW106_201023,							
0958_MW128_201023,	0958_MW134_201023,							
0958_MW129_201023,	0958_MW126_201023,							
0958_MW125_201023,	0958_MW137_201023,							
0958_MW141_201023,	0958_QC301_201023,							
0958_QC401_201023								



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		23-Oct-2020	02-Nov-2020	21-Apr-2021	✔	03-Nov-2020	21-Apr-2021	✔
0958_MW140_201023,								
0958_MW138_201023,								
0958_MW136_201023,								
0958_MW133_201023,								
0958_MW131_201023,								
0958_MW128_201023,								
0958_MW129_201023,								
0958_MW125_201023,								
0958_MW141_201023,								
0958_QC401_201023								



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	31	12.90	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	23	13.04	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	36	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	31	12.90	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	23	17.39	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	36	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	31	6.45	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	36	5.56	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	31	6.45	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



Custody Document for Submissions via ALS Compass App

Project: DEF19009 Client: EXTEND Project Manager: [REDACTED]
Phone: [REDACTED]
ALS Compass COC Reference: 15384 # Samples: [REDACTED] Sampler: [REDACTED]
15383, 15382, 15381, 15323 Phone: [REDACTED]
Turnaround Requirements: Standard Urgent [REDACTED]

Special Instructions:

ALS Use Only

Custody seal intact?

YES NO N/A

Free ice / frozen ice bricks upon receipt?

YES NO N/A

Random sample temperature on receipt?

28 °C

Custody	[REDACTED]
Relinquished by:	Received by:
[REDACTED]	[REDACTED]
Date / Time:	Date / Time:
<u>29/10/20</u>	<u>16:44</u> <u>29/10/20</u>

**CHAIN OF CUSTODY**

COC#: 15373

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW402		29/10/2020 02:01 PM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_MW142		29/10/2020 02:04 PM	Water	ALS: 4 Non ALS: 0	No	X			
003	0958_MW403		29/10/2020 02:05 PM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_QC301		29/10/2020 02:07 PM	Water	ALS: 2 Non ALS: 0	No		X		

**CHAIN OF CUSTODY****(ALS)****COC#: 15373**

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW402	Clear Plastic Bottle - Natural	250 mL	00070719062427	Green	No	
001	0958_MW402	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058066	Purple	No	
001	0958_MW402	HDPE (no PTFE)	20 mL	00352005005193	Grey	No	
001	0958_MW402	HDPE (no PTFE)	20 mL	00352005006526	Grey	No	
002	0958_MW142	Clear Plastic Bottle - Natural	250 mL	00070719062367	Green	No	
002	0958_MW142	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058012	Purple	No	
002	0958_MW142	HDPE (no PTFE)	20 mL	00352005005303	Grey	No	
002	0958_MW142	HDPE (no PTFE)	20 mL	00352005006306	Grey	No	
003	0958_MW403	Clear Plastic Bottle - Natural	250 mL	00070719062393	Green	No	
003	0958_MW403	HDPE (no PTFE)	20 mL	00352005005067	Grey	No	
003	0958_MW403	HDPE (no PTFE)	20 mL	00352005005256	Grey	No	
003	0958_MW403	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058090	Purple	No	
004	0958_QC301	HDPE (no PTFE)	20 mL	00352005020497	Grey	No	
004	0958_QC301	HDPE (no PTFE)	20 mL	00352005020655	Grey	No	

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

CERTIFICATE OF ANALYSIS

Work Order : **EP2011863**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 15373
Sampler : [REDACTED] [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 5
No. of samples analysed : 5

Page : 1 of 8
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 29-Oct-2020 16:44
Date Analysis Commenced : 02-Nov-2020
Issue Date : 09-Nov-2020 22:18



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high for sample #2 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW402_201029	0958_MW142_201029	0958_MW403_201029	----	----
Client sampling date / time				29-Oct-2020 14:01	29-Oct-2020 14:04	29-Oct-2020 14:05	----	----
Compound	CAS Number	LOR	Unit	EP2011863-001	EP2011863-002	EP2011863-003	-----	-----
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.80	4.36	5.93	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	322	230	179	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	80	21	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	91	<1	2	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	91	<1	2	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	2	13	22	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	143	63	86	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	4	1	2	----	----
Magnesium	7439-95-4	1	mg/L	<1	5	6	----	----
Sodium	7440-23-5	1	mg/L	113	39	58	----	----
Potassium	7440-09-7	1	mg/L	<1	2	2	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	5.89	2.05	2.92	----	----
∅ Total Cations	----	0.01	meq/L	5.11	2.21	3.17	----	----
∅ Ionic Balance	----	0.01	%	7.08	3.78	4.00	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	43	2	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.07	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.50	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW402_201029	0958_MW142_201029	0958_MW403_201029	----	----
Client sampling date / time				29-Oct-2020 14:01	29-Oct-2020 14:04	29-Oct-2020 14:05	----	----
Compound	CAS Number	LOR	Unit	EP2011863-001	EP2011863-002	EP2011863-003	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.27	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.13	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Client sample ID

				0958_MW402_201029	0958_MW142_201029	0958_MW403_201029	----	----
Client sampling date / time				29-Oct-2020 14:01	29-Oct-2020 14:04	29-Oct-2020 14:05	----	----
Compound	CAS Number	LOR	Unit	EP2011863-001	EP2011863-002	EP2011863-003	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.13	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.77	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.03	<0.01	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	118	117	118	----	----
13C8-PFOA	----	0.02	%	118	112	110	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Client sample ID

				0958_QC301_201029	0958_QC401_201029	----	----	----
Client sampling date / time				29-Oct-2020 14:07	29-Oct-2020 14:07	----	----	----
Compound	CAS Number	LOR	Unit	EP2011863-004	EP2011863-005	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	0958_QC301_201029	0958_QC401_201029	----	----	----
Client sampling date / time					29-Oct-2020 14:07	29-Oct-2020 14:07	----	----	----
Compound	CAS Number	LOR	Unit		EP2011863-004	EP2011863-005	-----	-----	-----
				Result	Result		----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		117	119	----	----	----
13C8-PFOA	----	0.02	%		116	116	----	----	----



Surrogate Control Limits

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

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

QUALITY CONTROL REPORT

Work Order	: EP2011863	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 29-Oct-2020
Order number	: DEF19009/330	Date Analysis Commenced	: 02-Nov-2020
C-O-C number	: 15373	Issue Date	: 09-Nov-2020
Sampler	: [REDACTED] [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3347745)									
EP2011856-019	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	4.88	4.93	1.02	0% - 20%
EP2011899-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.95	7.95	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3346586)									
EP2011863-001	0958_MW402_201029	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	322	296	8.41	0% - 20%
EP2011934-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	555	554	0.180	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3346587)									
EP2011863-001	0958_MW402_201029	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3347746)									
EP2011869-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	510	557	8.91	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	510	557	8.91	0% - 20%
EP2011856-019	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	6	5	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	6	5	0.00	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3341479)									
EP2011854-004	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	151	151	0.00	0% - 20%
EP2011852-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	8	8	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3341480)									
EP2011852-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	60	60	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3340300)									
EP2011311-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	9	9	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	12	12	0.00	0% - 50%

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 Work Order : EP2011863
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3340300) - continued									
EP2011311-003	Anonymous	ED093F: Sodium	7440-23-5	1	mg/L	374	371	0.848	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	70	70	0.00	0% - 20%
EP2011891-006	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	31	29	4.92	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	5	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	91	88	4.04	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	9	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3348015)									
EP2011828-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	8	9	0.00	No Limit
EP2011956-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	81	81	0.00	0% - 20%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3347745)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.2	98.5	102
				----	7 pH Unit	99.8	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3346586)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3346587)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	103	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3347746)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	97.4	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3341479)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	104	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3341480)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3340300)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	98.6	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	102	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.2	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.6	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3348015)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	104	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3346124)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	97.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	106	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	108	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	111	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3346124) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	120	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	102	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3346124)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	107	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	115	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	119	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	117	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	117	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	116	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	110	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3346124)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	114	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	128	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	138	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	103	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	105	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	113	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	112	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3346124)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	113	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	123	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	120	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	115	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3341479)							
EP2011803-059	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	119	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3341480)							
EP2011852-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	110	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3348015)							
EP2011830-001	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2011863	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 29-Oct-2020
Site	: DEF19009/Gingin	Issue Date	: 09-Nov-2020
Sampler	: [REDACTED] [REDACTED]	No. of samples received	: 5
Order number	: DEF19009/330	No. of samples analysed	: 5

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW402_201029,	0958_MW142_201029,	----	----	----	05-Nov-2020	29-Oct-2020	7
0958 MW403 201029							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Method					
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	05-Nov-2020	29-Oct-2020	✘
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	05-Nov-2020	05-Nov-2020	✔
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	05-Nov-2020	05-Nov-2020	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	05-Nov-2020	12-Nov-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	06-Nov-2020	26-Nov-2020	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	06-Nov-2020	26-Nov-2020	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	02-Nov-2020	05-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0958_MW402_201029, 0958_MW403_201029	0958_MW142_201029,	29-Oct-2020	----	----	----	05-Nov-2020	26-Nov-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0958_MW402_201029, 0958_MW403_201029, 0958_QC401_201029	0958_MW142_201029, 0958_QC301_201029,	29-Oct-2020	05-Nov-2020	27-Apr-2021	✓	06-Nov-2020	27-Apr-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0958_MW402_201029, 0958_MW403_201029, 0958_QC401_201029	0958_MW142_201029, 0958_QC301_201029,	29-Oct-2020	05-Nov-2020	27-Apr-2021	✓	06-Nov-2020	27-Apr-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0958_MW402_201029, 0958_MW403_201029, 0958_QC401_201029	0958_MW142_201029, 0958_QC301_201029,	29-Oct-2020	05-Nov-2020	27-Apr-2021	✓	06-Nov-2020	27-Apr-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0958_MW402_201029, 0958_MW403_201029, 0958_QC401_201029	0958_MW142_201029, 0958_QC301_201029,	29-Oct-2020	05-Nov-2020	27-Apr-2021	✓	06-Nov-2020	27-Apr-2021	✓



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0958_MW402_201029, 0958_MW403_201029, 0958_QC401_201029	0958_MW142_201029, 0958_QC301_201029,	29-Oct-2020	05-Nov-2020	27-Apr-2021	✔	06-Nov-2020	27-Apr-2021	✔



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	3	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	8	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	3	66.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	5.56	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



Eurofins | Environment Testing ABN 50 006 085 521

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

☐ **Brisbane Laboratory**
Unit 1 21 Smallwood Place Murarie QLD 4172
07 3902 4500 EnviroSampleQLD@surcofins.com

☒ **Perth Laboratory**
Unit 2 81 Leach Highway Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ **Melbourne Laboratory**
6 Monterey Road Dandenong South VIC 3175
03 8554 5000 EnviroSampleVic@eurofins.com

Company		CARDNO	Project No		WA_0958_PFASOMP		Project Manager			Sampler(s)		MB			
Address		11 harvest Tce WEST PERTH	Project Name		WA_0958_PFASOMP		EDD Format ESdat, EQuIS etc		ESdat		Handed over by		ALS		
Contact Name			Analyses <small>Where matrix not requested, please specify "Total" or "Filtered" Sulfide code must be used to allow Sulfide phasing</small>									Email for Invoice			
Phone No									Email for Results						
Special Directions		Please send ESdat report to [redacted] with the project ID in the header file.							Containers <small>Change container type & size if necessary</small>		Required Turnaround Time (TAT) <small>Default will be 5 days if not stated</small>				
Purchase Order		DEF19009/330							500mL Plastic		Oversight will apply				
Quote ID No									250mL Plastic		☐ Overnight (reporting by 9am)+				
									125mL Plastic		☐ Same day+ ☐ 1 day+				
									200mL Amber Glass		☐ 2 days+ ☐ 3 days+				
									40mL VOA vial		☒ 5 days (Standard)				
									500mL PFAS Bottle		☐ Other(				
									Jar (Glass or HDPE)		Other (Ambient AS/NZS WA Guidelines)				
											Sample Comments / Dangerous Goods Hazard Warning				
No	Client Sample ID	Sampled Date/Time <small>d/m/yyyy hh:mm</small>	Matrix Solid (S) Water (W)	Full PFAS suite	(water) Major anions & cations	(water) DOC, TSS, pH	(sediment) TOC, CEC, pH								
1	0958_QC201_201014	14-10-20	W	X	X	X									
2	0958-QC202_201014	14-10-20	W	X	X	X									
3															
4															
5															
6															
7															
8															
9															
10															
Total Counts															
Method of Shipment				☐ Courier (#) ☐ Hand Delivered ☐ Postal		Name		Signature		Date		Time			
Laboratory Use Only				Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Temperature			
				Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Report No			

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



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Site Number 23736

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

Attention:

Report 751043-W
Project name WA_0958_PFSOMP
Project ID WA_0958_PFSOMP
Received Date Oct 15, 2020

Client Sample ID			0958_Q201_201014	0958_Q202_201015
Sample Matrix			Water	Water
Eurofins Sample No.			P20-Oc28725	P20-Oc28726
Date Sampled			Oct 14, 2020	Oct 14, 2020
Test/Reference	LOR	Unit		
Chloride	1	mg/L	32	120
Dissolved Organic Carbon	5	mg/L	23	8.3
pH (at 25 °C)	0.1	pH Units	5.8	7.1
Sulphate (as SO ₄)	5	mg/L	15	< 5
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	110	250
Total Suspended Solids Dried at 103–105°C	1	mg/L	5.3	< 1
Alkalinity (speciated)				
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	< 20	53
Carbonate Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Hydroxide Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Total Alkalinity (as CaCO ₃)	20	mg/L	< 20	53
Eurofins Suite B11C: Na/K/Ca/Mg				
Calcium	0.5	mg/L	4.6	19
Magnesium	0.5	mg/L	5.3	4.6
Potassium	0.5	mg/L	1.3	1.4
Sodium	0.5	mg/L	23	82
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	< 0.01	0.02
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	< 0.01	0.10
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.02
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	70	66
13C5-PFPeA (surr.)	1	%	90	93
13C5-PFHxA (surr.)	1	%	83	81
13C4-PFHpA (surr.)	1	%	79	84
13C8-PFOA (surr.)	1	%	86	90
13C5-PFNA (surr.)	1	%	69	75
13C6-PFDA (surr.)	1	%	67	68

Client Sample ID			0958_Q201_201014	0958_Q202_201015
Sample Matrix			Water	Water
Eurofins Sample No.			P20-Oc28725	P20-Oc28726
Date Sampled			Oct 14, 2020	Oct 14, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
13C2-PFUnDA (surr.)	1	%	65	68
13C2-PFDoDA (surr.)	1	%	61	62
13C2-PFTeDA (surr.)	1	%	45	38
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	101	121
D3-N-MeFOSA (surr.)	1	%	132	138
D5-N-EtFOSA (surr.)	1	%	144	151
D7-N-MeFOSE (surr.)	1	%	140	139
D9-N-EtFOSE (surr.)	1	%	177	155
D5-N-EtFOSAA (surr.)	1	%	91	87
D3-N-MeFOSAA (surr.)	1	%	51	51
Perfluoroalkyl sulfonic acids (PFASs)				
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	< 0.01	0.07
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01	0.04
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	< 0.01	^{N09} 0.07
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	^{N09} 0.04	^{N09} 0.48
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	< 0.01	^{N09} 0.03
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	^{N09} 0.03	^{N09} 0.27
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	98	100
18O2-PFHxS (surr.)	1	%	87	83
13C8-PFOS (surr.)	1	%	87	94
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	79	79
13C2-6:2 FTSA (surr.)	1	%	57	59
13C2-8:2 FTSA (surr.)	1	%	62	51
13C2-10:2 FTSA (surr.)	1	%	68	64

Client Sample ID			0958_Q201_201014	0958_Q202_201015
Sample Matrix			Water	Water
Eurofins Sample No.			P20-Oc28725	P20-Oc28726
Date Sampled			Oct 14, 2020	Oct 14, 2020
Test/Reference	LOR	Unit		
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	0.07	0.75
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.03	0.29
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.07	0.77
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.07	0.97
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	1.11

Sample History

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

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO₄/Alkalinity			
Chloride	Melbourne	Oct 19, 2020	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO ₄)	Melbourne	Oct 19, 2020	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Perth	Oct 16, 2020	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Dissolved Organic Carbon	Melbourne	Oct 19, 2020	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Perth	Oct 16, 2020	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Oct 19, 2020	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Perth	Oct 16, 2020	180 Days
- Method: LTM-MET-3010 Alkali Metals, S, Si and P by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Oct 19, 2020	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Oct 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Oct 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFASs)	Brisbane	Oct 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Oct 19, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand

Auckland
35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

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

Project Name: WA_0958_PFASOMP
Project ID: WA_0958_PFASOMP

Order No.:
Report #: 751043
Phone:
Fax:

Received: Oct 15, 2020 3:11 PM
Due: Oct 22, 2020
Priority: 5 Day
Contact Name:

Eurofins Analytical Services Manager :

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X		X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794										X		
Perth Laboratory - NATA Site # 23736							X		X		X	
Mayfield Laboratory												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	0958_Q201_201014	Oct 14, 2020		Water	P20-Oc28725	X	X	X	X	X	X	X
2	0958_Q202_201015	Oct 14, 2020		Water	P20-Oc28726	X	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2	2

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Hydroxide Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTriDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	105			70-130	Pass	
Sulphate (as SO ₄)	%	110			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	93			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	100			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Total Alkalinity (as CaCO ₃)	%	109			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	101			80-120	Pass	
Magnesium	%	104			80-120	Pass	
Potassium	%	98			80-120	Pass	
Sodium	%	102			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	92			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	90			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	92			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	92			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	87			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	92			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	90			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	96			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	95			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	149			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	93			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	93			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	112			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	101			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	101			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	105			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	88			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	89			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	85			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	83			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	122			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	76			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	86			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	84			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	79			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	76			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	95			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	106			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	83			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	89			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	M20-Oc30476	NCP	%	72			70-130	Pass	
Sulphate (as SO ₄)	M20-Oc30476	NCP	%	98			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	S20-Oc26480	NCP	%	103			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Total Alkalinity (as CaCO ₃)	P20-Oc28683	NCP	%	95			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	P20-Oc28756	NCP	%	101			75-125	Pass	
Magnesium	P20-Oc28756	NCP	%	105			75-125	Pass	
Potassium	P20-Oc28756	NCP	%	101			75-125	Pass	
Sodium	P20-Oc28756	NCP	%	101			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	P20-Oc28726	CP	%	97			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P20-Oc28726	CP	%	94			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P20-Oc28726	CP	%	97			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P20-Oc28726	CP	%	96			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P20-Oc28726	CP	%	95			50-150	Pass	
Perfluorononanoic acid (PFNA)	P20-Oc28726	CP	%	93			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P20-Oc28726	CP	%	95			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P20-Oc28726	CP	%	95			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P20-Oc28726	CP	%	96			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P20-Oc28726	CP	%	110			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P20-Oc28726	CP	%	96			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	P20-Oc28726	CP	%	98			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P20-Oc28726	CP	%	97			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P20-Oc28726	CP	%	84			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P20-Oc28726	CP	%	91			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P20-Oc28726	CP	%	90			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P20-Oc28726	CP	%	92			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P20-Oc28726	CP	%	89			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P20-Oc28726	CP	%	87			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P20-Oc28726	CP	%	92			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoropropanesulfonic acid (PFPrS)	P20-Oc28726	CP	%	135			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P20-Oc28726	CP	%	88			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P20-Oc28726	CP	%	106			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P20-Oc28726	CP	%	106			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P20-Oc28726	CP	%	114			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P20-Oc28726	CP	%	89			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P20-Oc28726	CP	%	106			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P20-Oc28726	CP	%	117			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P20-Oc28726	CP	%	82			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P20-Oc28726	CP	%	88			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	P20-Oc29136	NCP	mg/L	96	94	2.0	30%	Pass	
Dissolved Organic Carbon	M20-Oc33584	NCP	mg/L	35	46	28	30%	Pass	
pH (at 25 °C)	P20-Oc28757	NCP	pH Units	6.8	6.7	1.0	30%	Pass	
Sulphate (as SO4)	P20-Oc29136	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	S20-Oc28454	NCP	mg/L	1200	1500	20	30%	Pass	
Total Suspended Solids Dried at 103–105°C	S20-Oc28389	NCP	mg/L	38	42	10	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	P20-Oc28757	NCP	mg/L	27	27	<1	30%	Pass	
Carbonate Alkalinity (as CaCO3)	P20-Oc28757	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO3)	P20-Oc28757	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO3)	P20-Oc28757	NCP	mg/L	27	27	<1	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	P20-Oc28743	NCP	mg/L	13	16	22	30%	Pass	
Magnesium	P20-Oc28743	NCP	mg/L	56	53	4.0	30%	Pass	
Potassium	P20-Oc28743	NCP	mg/L	19	18	3.0	30%	Pass	
Sodium	P20-Oc28743	NCP	mg/L	440	390	5.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluoroundecanoic acid (PFUnDA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	P20-Oc28725	CP	ug/L	0.04	0.05	2.0	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	P20-Oc28725	CP	ug/L	0.03	0.03	3.0	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P20-Oc28725	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P20-Oc28725	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments

Sample Integrity

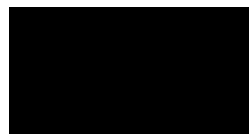
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

	Analytical Services Manager
	Senior Analyst-Metal (WA)
	Senior Analyst-Inorganic (WA)
	Senior Analyst-PFAS (QLD)
	Senior Analyst-Inorganic (VIC)



General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

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CHAIN OF CUSTODY RECORD

Eurofins | Environmental Testing ABN 50 006 086 521

☐ Sydney Laboratory
Unit F3 Bld.F 16 Mars Road Lane Cove West NSW 2085
02 8900 8400 EnviroSampleNSW@eurofins.com

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

☒ Perth Laboratory
Unit 2 81 Leach Highway Kewdale WA 6105
08 9261 8600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
6 Moneray Road Dandenong South VIC 3175
03 8584 5000 EnviroSampleVic@eurofins.com

Company	CARDNO	Project No	WA_0958_PFASOMP	Project Manager		Sampler(s)								
Address	11 harvest Tce WEST PERTH	Project Name	WA_0958_PFASOMP	EDD Format ESdat ESqS etc	ESdat	Handed over by	ALS							
Contact Name		Analyses Where metals are requested, please specify 'Total' or 'Filtered' SUTE code must be used to attach SUTE pricing	Full PFAS suite (water) Major anions & cations (water) DOC, TSS, pH (sediment) TOC, CEC, pH			Email for Invoice								
Phone No						Email for Results								
Special Directions	Please send ESdat report to with the project ID in the header file.					Containers Charge container type & size if necessary.		Required Turnaround Time (TAT) Default will be 5 days if not noted						
Purchase Order	DEF19009/330 / 100					500mL Plastic	250mL Plastic	125mL Plastic	200mL Amber Glass	40mL VOA Vial	800mL PFAS Bottle	Jar (Glass or HDPE)	Other (Asbestos AS4804, WA Guidelines)	☐ Overnight (reporting by 9am) ☐ Same day ☐ 1 day ☐ 2 days ☐ 3 days ☒ 5 days (Standard) ☐ Other
Quote ID No						Sample Comments / Dangerous Goods Hazard Warning								
No	Client Sample ID	Sampled Date/Time dd/mm/yyyy hh:mm	Matrix Solid (S) Water (W)											
1	0958_0000_GIC203_201015	15/10/20	W	X	X	X								
2	0958_GIC204_201015	15/10/20	W	X	X	X								
3														
4														
5														
6														
7														
8														
9														
10														
Total Counts				2	2	2								
Method of Shipment	☐ Courier (#) ☐ Hand Delivered ☐ Postal	Name		Signature		Date		Time						
Laboratory Use Only	Received By	SYD BNE MEL PER ADL NTL DRW	Signature		Date	16/10/20	Time	14:01	Temperature	10.2°C				
	Received By	SYD BNE MEL PER ADL NTL DRW	Signature		Date		Time		Report No	751054				

Date/Time 16/10/20 14:01
Temp 10.2°C
Correction: 10.2°C
Final Temp: 10.2°C

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 23736

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

Attention:

Report 751054-W
Project name WA_0958_PFSOMP
Project ID WA_0958_PFSOMP
Received Date Oct 16, 2020

Client Sample ID			0958_Q203_201015	0958_Q204_201015
Sample Matrix			Water	Water
Eurofins Sample No.			P20-Oc28756	P20-Oc28757
Date Sampled			Oct 15, 2020	Oct 15, 2020
Test/Reference	LOR	Unit		
Chloride	1	mg/L	16	28
Dissolved Organic Carbon	5	mg/L	16	22
pH (at 25 °C)	0.1	pH Units	4.5	6.8
Sulphate (as SO ₄)	5	mg/L	38	8.0
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	84	120
Total Suspended Solids Dried at 103–105°C	1	mg/L	1200	120
Alkalinity (speciated)				
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	< 20	27
Carbonate Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Hydroxide Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Total Alkalinity (as CaCO ₃)	20	mg/L	< 20	27
Eurofins Suite B11C: Na/K/Ca/Mg				
Calcium	0.5	mg/L	2.5	23
Magnesium	0.5	mg/L	9.3	2.5
Potassium	0.5	mg/L	1.9	1.9
Sodium	0.5	mg/L	13	19
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	0.07	< 0.01
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	0.27	< 0.01
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	^{N09} 0.04	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	^{N09} 0.26	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	124	91
13C5-PFPeA (surr.)	1	%	143	86
13C5-PFHxA (surr.)	1	%	138	110
13C4-PFHpA (surr.)	1	%	132	108
13C8-PFOA (surr.)	1	%	133	109
13C5-PFNA (surr.)	1	%	135	82
13C6-PFDA (surr.)	1	%	85	68

Client Sample ID			0958_Q203_201015	0958_Q204_201015
Sample Matrix			Water	Water
Eurofins Sample No.			P20-Oc28756	P20-Oc28757
Date Sampled			Oct 15, 2020	Oct 15, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
13C2-PFUnDA (surr.)	1	%	57	81
13C2-PFDoDA (surr.)	1	%	35	73
13C2-PFTeDA (surr.)	1	%	16	109
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	60	82
D3-N-MeFOSA (surr.)	1	%	63	55
D5-N-EtFOSA (surr.)	1	%	60	71
D7-N-MeFOSE (surr.)	1	%	32	91
D9-N-EtFOSE (surr.)	1	%	42	88
D5-N-EtFOSAA (surr.)	1	%	24	40
D3-N-MeFOSAA (surr.)	1	%	19	32
Perfluoroalkyl sulfonic acids (PFSA)s				
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	0.14	< 0.01
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	0.03	< 0.01
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	^{N09} 0.20	< 0.01
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	^{N09} 3.4	^{N09} 0.12
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	^{N09} 0.32	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	^{N09} 3.2	^{N09} 0.04
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	144	124
18O2-PFHxS (surr.)	1	%	124	110
13C8-PFOS (surr.)	1	%	108	103
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)s				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	172	97
13C2-6:2 FTSA (surr.)	1	%	87	110
13C2-8:2 FTSA (surr.)	1	%	82	57
13C2-10:2 FTSA (surr.)	1	%	38	49

Client Sample ID			0958_Q203_201015	0958_Q204_201015
Sample Matrix			Water	Water
Eurofins Sample No.			P20-Oc28756	P20-Oc28757
Date Sampled			Oct 15, 2020	Oct 15, 2020
Test/Reference	LOR	Unit		
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	6.6	0.16
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	3.46	0.04
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	6.86	0.16
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	7.38	0.16
Sum of PFASs (n=30)*	0.1	ug/L	7.93	0.16

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO₄/Alkalinity			
Chloride	Melbourne	Oct 20, 2020	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO ₄)	Melbourne	Oct 20, 2020	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Perth	Oct 16, 2020	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Dissolved Organic Carbon	Melbourne	Oct 20, 2020	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Perth	Oct 16, 2020	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Oct 20, 2020	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Perth	Oct 16, 2020	180 Days
- Method: LTM-MET-3010 Alkali Metals, S, Si and P by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Oct 20, 2020	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Oct 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Oct 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFASs)	Brisbane	Oct 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Oct 21, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand

Auckland
35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

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

Project Name: WA_0958_PFASOMP
Project ID: WA_0958_PFASOMP

Order No.: DEF19009/330/100
Report #: 751054
Phone: [REDACTED]
Fax: [REDACTED]

Received: Oct 16, 2020 2:01 PM
Due: Oct 23, 2020
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X		X	X	X		X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794										X		
Perth Laboratory - NATA Site # 23736							X		X		X	
Mayfield Laboratory												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	0958_Q203_201015	Oct 15, 2020		Water	P20-Oc28756	X	X	X	X	X	X	X
2	0958_Q204_201015	Oct 15, 2020		Water	P20-Oc28757	X	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2	2

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Hydroxide Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTriDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	111			70-130	Pass	
Sulphate (as SO ₄)	%	111			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	93			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	97			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Total Alkalinity (as CaCO ₃)	%	109			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	103			80-120	Pass	
Magnesium	%	106			80-120	Pass	
Potassium	%	102			80-120	Pass	
Sodium	%	104			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	100			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	93			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	93			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	104			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	77			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	84			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	94			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	101			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	120			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	67			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	136			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	97			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	126			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	138			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	147			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	126			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	129			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	100			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	78			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	92			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	92			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	100			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	79			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	97			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	94			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	78			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	95			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	142			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	118			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	89			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S20-Oc31141	NCP	%	104			70-130	Pass	
Sulphate (as SO ₄)	S20-Oc31141	NCP	%	101			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	S20-Oc33201	NCP	%	97			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Total Alkalinity (as CaCO ₃)	P20-Oc28683	NCP	%	95			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	P20-Oc28756	CP	%	101			75-125	Pass	
Magnesium	P20-Oc28756	CP	%	105			75-125	Pass	
Potassium	P20-Oc28756	CP	%	101			75-125	Pass	
Sodium	P20-Oc28756	CP	%	101			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	P20-Oc28756	CP	%	111			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P20-Oc28756	CP	%	102			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P20-Oc28756	CP	%	144			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P20-Oc28756	CP	%	79			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P20-Oc28756	CP	%	77			50-150	Pass	
Perfluorononanoic acid (PFNA)	P20-Oc28756	CP	%	99			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P20-Oc28756	CP	%	90			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P20-Oc28756	CP	%	89			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P20-Oc28756	CP	%	133			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P20-Oc28756	CP	%	97			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P20-Oc28756	CP	%	116			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	P20-Oc28756	CP	%	97			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P20-Oc28756	CP	%	118			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P20-Oc28756	CP	%	130			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P20-Oc28756	CP	%	54			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P20-Oc28756	CP	%	119			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P20-Oc28756	CP	%	116			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P20-Oc28756	CP	%	101			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P20-Oc28756	CP	%	73			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P20-Oc28756	CP	%	93			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoropropanesulfonic acid (PFPrS)	P20-Oc28756	CP	%	95			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	P20-Oc28756	CP	%	129			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P20-Oc28756	CP	%	108			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P20-Oc28756	CP	%	84			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P20-Oc28756	CP	%	83			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P20-Oc28756	CP	%	64			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P20-Oc28756	CP	%	131			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P20-Oc28756	CP	%	132			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P20-Oc28756	CP	%	135			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P20-Oc28756	CP	%	108			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Dissolved Organic Carbon	M20-Oc33584	NCP	mg/L	35	46	28	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	S20-Oc28454	NCP	mg/L	1200	1500	20	30%	Pass	
Total Suspended Solids Dried at 103–105°C	S20-Oc33209	NCP	mg/L	2900	2800	4.0	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	P20-Oc28743	NCP	mg/L	13	16	22	30%	Pass	
Magnesium	P20-Oc28743	NCP	mg/L	56	53	4.0	30%	Pass	
Potassium	P20-Oc28743	NCP	mg/L	19	18	3.0	30%	Pass	
Sodium	P20-Oc28743	NCP	mg/L	440	390	5.0	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	P20-Oc28757	CP	mg/L	28	31	11	30%	Pass	
pH (at 25 °C)	P20-Oc28757	CP	pH Units	6.8	6.7	1.0	30%	Pass	
Sulphate (as SO ₄)	P20-Oc28757	CP	mg/L	8.0	8.7	8.0	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO ₃)	P20-Oc28757	CP	mg/L	27	27	<1	30%	Pass	
Carbonate Alkalinity (as CaCO ₃)	P20-Oc28757	CP	mg/L	< 20	< 20	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO ₃)	P20-Oc28757	CP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO ₃)	P20-Oc28757	CP	mg/L	27	27	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorodecanoic acid (PFDA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	P20-Oc28757	CP	ug/L	0.12	0.11	1.0	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	P20-Oc28757	CP	ug/L	0.04	0.04	2.0	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P20-Oc28757	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P20-Oc28757	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Quality Control Analyte Summary Compliance

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

Analysis	Samples Analysed	Laboratory Duplicates Reported	Laboratory Matrix Spikes Reported	Method Blanks Reported	Laboratory Control Samples Reported
Chloride	2	1	1	1	1
Dissolved Organic Carbon	2	1	NA	NA	NA
pH (at 25 °C)	2	1	NA	NA	NA
Sulphate (as SO ₄)	2	1	1	1	1
Total Dissolved Solids Dried at 180°C ± 2°C	2	1	NA	1	1
Total Suspended Solids Dried at 103–105°C	2	1	1	1	1
Alkalinity (speciated)	2	1	1	1	1
Eurofins Suite B11C: Na/K/Ca/Mg	2	1	1	1	1
Perfluoroalkyl carboxylic acids (PFCAs)	2	1	1	1	1
Perfluoroalkyl sulfonamido substances	2	1	1	1	1
Perfluoroalkyl sulfonic acids (PFSAAs)	2	1	1	1	1
n:2 Fluorotelomer sulfonic acids (n:2 FTSAAs)	2	1	1	1	1

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

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

Method blank

One method blank per process batch.

Laboratory duplicate

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

Laboratory control sample (LCS)

There should be at least one LCS per process batch.

Matrix spikes

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

Comments

Sample Integrity

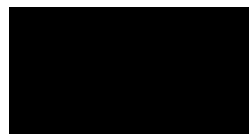
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

	Analytical Services Manager
	Senior Analyst-Metal (WA)
	Senior Analyst-Inorganic (WA)
	Senior Analyst-PFAS (QLD)
	Senior Analyst-Inorganic (VIC)



General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Monitoring Date	Monitoring Site ID	Sample_ID	Bore Depth (m)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)	Other Observations on Bore/Site	Purge Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	QC Dup Sample #	Odour Comments	What colour is the Sample
21/10/2020	MW101						Dry	HydroSleeve									
21/10/2020	MW102	0958_MW102_201021	21.379	12.183	73.5	61.317		HydroSleeve	20.8	14.02	141.9	92.3	6.28	-61.1		no	Clear
21/10/2020	MW504	0958_MW103_201021	12.49	8.159	72.822	64.663		HydroSleeve	22.3	1.5	125.1	85.8	5	133.1		no	Cloudy,Brown
21/10/2020	MW104	0958_MW104_201021	40.005	12.322	73.74	61.418		HydroSleeve	21	2.19	221.5	156	5.43	78.7		no	Cloudy
21/10/2020	MW105	0958_MW105_201021	23.02	12.205	73.79	61.585		HydroSleeve	22.1	4.47	121.2	78.65	4.82	14.9		no	Yellow,Clear
23/10/2020	MW106	0958_MW106_201023		6.948	71.54	64.592		HydroSleeve	20.6	4.51	256.8	181.35	2.79	211.8		no	Brown
23/10/2020	MW107		6.431				Dry	HydroSleeve									
23/10/2020	MW108		5.772				Dry	HydroSleeve									
21/10/2020	MW109	0958_MW109_201021	9.958	7.966	73.45	65.484		HydroSleeve	20.4	1.01	143.6	93.6	3.51	277.2		no	Yellow,Brown
21/10/2020	MW110	0958_MW110_201021	9.821	8.411	73.74	65.329		HydroSleeve	20.5	2.07	126.5	81.9	3.68	248		no	Brown
15/10/2020	MW111						Dry	HydroSleeve									
21/10/2020	MW112	0958_MW112_201021	8.692	11.006	73.69	62.684		HydroSleeve	20.5	6.22	137.4	89.05	3.24	267.2		no	Yellow
21/10/2020	MW113	0958_MW113_201021	10.068	8.884	73.79	64.906		HydroSleeve	20.1	2.55	161.7	104.65	3.22	276.1		no	Yellow
14/10/2020	MW114	0958_MW114_201014		7.45	73.68	66.23	Not enough water for hydrasleeve	HandBailing	22.9	5.11	180	122.2	6.15	2325		no	Brown
21/10/2020	MW115	0958_MW115_201021	7.906	5.668	70.79	65.122		HydroSleeve	21.3	2.19	196.5	109.85	3.36	255.1		no	Clear
21/10/2020	MW116	0958_MW116_201021	11.601	9.826	74.43	64.604		HydroSleeve	19.7	2.08	146.3	94.9	3.35	175.9		no	Yellow
21/10/2020	MW117	0958_MW117_201021	19.72	13.926	74.19	60.264		HydroSleeve	20.4	1.17	124.1	80.6	4.87	50.6		no	Clear
21/10/2020	MW118	0958_MW118_201021	43.37	13.988	74.19	60.202		HydroSleeve	20.8	1.99	200.1	141.05	4.97	51		no	Clear
21/10/2020	MW119		12.335				Dry	HydroSleeve									
21/10/2020	MW120	0958_MW120_201021	23.13	15.051	73.84	58.789		HydroSleeve	21	2.68	92.2	59.8	4.36	94.1		no	Yellow
21/10/2020	MW121	0958_MW121_201021	22.571	15.185	73.96	58.775		HydroSleeve	21.3	0.83	295.6	191.75	5.52	-9.9		no	Clear,Black
21/10/2020	MW122	0958_MW122_201021	14.019	13.568	75.84	62.272		HydroSleeve	22.5	7.01	143.8	93.6	3.45	247.7		no	Yellow,Brown
14/10/2020	MW123	0958_MW123_201014		16.1	76.03	59.93	Qc101, 201	HydroSleeve	21.1	4.08	199.8	140.4	5.75	-134 101		Sulfur	Yellow
21/10/2020	MW124	0958_MW124_201021	42.033	16.721	75.91	59.189		HydroSleeve	21.4	0.86	190.8	124.15	4.67	167.5		no	Cloudy
23/10/2020	MW125	0958_MW125_201023		14.425	74.88	60.455		HydroSleeve	19.9	0.79	111.6	72.8	4.54	55.2		no	Clear,Yellow
23/10/2020	MW126	0958_MW126_201023		13.284	73.5	60.216		HydroSleeve	20.2	0.83	180.3	128.7	4.82	46.3		no	Clear
23/10/2020	MW128	0958_MW128_201023		16.897	74.4	57.503		HydroSleeve	19.6	1.01	198.7	129.35	4.51	109.6		no	Cloudy
23/10/2020	MW129	0958_MW129_201023		15.99	73.51	57.52		HydroSleeve	19.8	2.73	189.1	122.85	4.53	35.3		no	Clear
23/10/2020	MW130	0958_MW130_201023		16.534	72.77	56.236		HydroSleeve	19.8	0.92	198.3	143	5.28	18.2		no	Clear,Black
23/10/2020	MW131	0958_MW131_201023		19.658	76.59	56.932		HydroSleeve	20.1	1.61	156.3	111.8	4.93	40.2		no	Cloudy
23/10/2020	MW132	0958_MW132_201023		19.278	76.43	57.152		HydroSleeve	20	0.91	205.5	133.25	4.95	9.7		no	Clear
23/10/2020	MW133	0958_MW133_201023		19.54	76.49	56.95		HydroSleeve	19.7	2.42	107.3	77.35	4.79	19.5		no	Clear
23/10/2020	MW134	0958_MW134_201023		21.681	78.48	56.799		HydroSleeve	19.6	1.49	171.8	124.8	4.96	24.8		no	Clear
23/10/2020	MW135	0958_MW135_201023	24.362	20.96	77.67	56.71		HydroSleeve	18.9	2.53	193.4	142.35	4.93	52.7		no	Yellow
23/10/2020	MW136	0958_MW136_201023		22.286	78.24	55.954		HydroSleeve	19.1	0.8	158.3	115.7	5.11	21.1		no	Clear
23/10/2020	MW137	0958_MW137_201023	8.794	8.489	73.12	64.631		HydroSleeve	22.2	10.88	233.9	152.1	3.43	236.5		no	Brown
23/10/2020	MW138	0958_MW138_201023	14.203	9.069	74.17	65.101		HydroSleeve	18.9	0.99	322	209.3	3.74	170.2		no	Black,Yellow
23/10/2020	MW139	0958_MW139_201023	31.041	13.986	73.99	60.004		HydroSleeve	18.6	2.04	206.6	134.55	5.73	-42		no	Clear
23/10/2020	MW140	0958_MW140_201023	54.8	13.816	73.9	60.084		HydroSleeve	19.1	6.14	410	299.65	5.42	-13.7		no	
23/10/2020	MW141	0958_MW141_201023		11.09	74.36	63.27		HydroSleeve	20.1	1.55	177.2	126.75	4.03	19.3		no	Clear
29/10/2020	MW142	0958_MW142_201029	15.371	13.804	76.338	62.534		HydroSleeve	20.4	21.11	285	185.25	4.73	84.5		no	Cloudy
29/10/2020	MW143		18.082				Dry	HydroSleeve									
21/10/2020	MW301	0958_MW301_201021	10.408	9.003	74.547	65.544		HydroSleeve	20.6	2.65	208.1	135.2	3.04	265.1		no	Yellow
21/10/2020	MW302	0958_MW302_201021	10.418	9.173	74.7115	65.5385		HydroSleeve	20.8	4.36	141.3	91.65	3.55	193.8		no	Yellow
21/10/2020	MW303	0958_MW303_201021	10.479	9.046	74.5744	65.5284		HydroSleeve	20.9	4.47	148.8	96.85	3.29	250.6		no	Yellow
15/10/2020	MW304	0958_MW304_201015		8.08	74.0937	66.0137		HandBailing	20.9	4.17	217.6	153.4	4.98	201.7		no	Cloudy,Brown
15/10/2020	MW305	0958_MW305_201015		7.94	73.8848	65.9448	Not enough water for hydrasleeve	HandBailing	21.5	2.43	164	114.4	4.69	188.1		no	Brown
15/10/2020	MW306	0958_MW306_201015		7.93	73.9645	66.0345	Not enough water for hydrasleeve	HandBailing	20.9	3.8	160.9	113.75	4.98	183.6 103/203		no	Cloudy,Yellow
15/10/2020	MW307	0958_MW307_201015		6.67	73.6345	66.9645		HydroSleeve	20.5	4.79	123.3	87.75	5.92	104.2		no	Cloudy
15/10/2020	MW308	0958_MW308_201015		7.64	73.6913	66.0513		HydroSleeve	20.6	4.3	391.3	277.55	6.89	161.5		no	Cloudy
15/10/2020	MW309	0958_MW309_201015		7.94	73.8988	65.9588		HydroSleeve	21.8	1.94	144.7	1001	4.95	196.6		no	Cloudy,Yellow
15/10/2020	MW310	0958_MW310_201015		7.77	73.8057	66.0357		HydroSleeve	21.7	4.36	258.4	179.4	6.85	71		no	Cloudy
21/10/2020	MW505	0958_MW311_201021	13.334	8.497	73.832	65.335		HydroSleeve	21.3	1.24	118.6	83.2	4.53	205.4		no	Brown,Clear
21/10/2020	MW312	0958_MW312_201021	9.908	8.627	74.5413	65.9143		HydroSleeve	20.9	1.94	162.1	105.3	4.52	258.1		no	Yellow,Brown
15/10/2020	MW313	0958_MW313_201015		8.73	74.6882	65.9582		HydroSleeve	21	5.23	190.9	134.55	6.37	140.4 104/204		no	Cloudy
15/10/2020	MW401	0958_MW401_201015					Abstraction bore	HydroSleeve	23.8	2.78	251.2	167.05	6.43	-46.6		no	Clear
29/10/2020	MW402	0958_MW402_201029					Abstraction bore		29.7	1.22	611	396.5	5.99	148		no	Clear
29/10/2020	MW403	0958_MW403_201029	27.8	21.144	73.84	52.696		HydroSleeve	19.7	1.25	366.2	237.5	4.36	127.2		no	Clear,Brown
14/10/2020	POT101	0958_POT101_201014						HydroSleeve	22.9	3.83	533	364	776	202.5		no	Clear
21/10/2020	POT102	0958_POT102_201021						HydroSleeve	25.2	4.98	551	357.5	6.2	190.9		no	Clear
14/10/2020	POT103	0958_POT103_201014						HydroSleeve	22.7	4.76	529	357.5	6.66	358.9		no	Cloudy
14/10/2020	POT104	0958_POT104_201014					QC102/202	HydroSleeve	23.3	7.31	524	351	6.68	321.9 102		no	Clear
14/10/2020	POT105	0958_POT105_201014						HydroSleeve	23.2	6.4	529	357.5	7.1	217.2		no	Cloudy

EQUIPMENT INFORMATION

Instrument: YSIPP13P

Serial Number: 14C102225 (Display)

Lot Number: 17F100380 (Sonde)

EQUIPMENT CHECK

Enclosed

Comment

YSI Pro Plus Display	☒
YSI Quatro Sonde	☒
Flow Cell	☒
Probe Guard	☒
Rubber Storage/Calibration	☒
Sleeve Calibration Cup + Cap	☒
YSI Pro Series ProComm II Kit	☒
Instruction Manual & Field Sheets	☒
Spare Batteries (x 2)	☒

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	$\pm 0.2^{\circ}\text{C}$	☒	☐
Dissolved Oxygen	☒ 100% Saturation	$\pm 2\%$	☒	☐
	Pressure Compensation	1015 hPa	☒	☐
Conductivity	☒ 1288mS/cm	$\pm 0.5\%$	☒	☐
	☒ Check linearity at 1.4mS/cm	$\pm 0.5\%$	☒	☐
Salinity	Auto Calibrated	$\pm 1\%$	☒	☐
pH	☒ pH 7.00	± 0.2	☒	☐
	☒ pH 4.00	± 0.2	☒	☐
ORP	☒ 240 mV at 20 $^{\circ}\text{C}$	$\pm 20\text{mV}$	☒	☐

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

ECO Environmental Equipment Specialist

Date: 08.10.2020

EQUIPMENT INFORMATION

Instrument: YSIPP7
 Serial Number: 14G100712(Display)
 Lot Number: 15J100050 (Sonde)

EQUIPMENT CHECK

Enclosed

Comment

YSI Pro Plus Display	☒
YSI Quatro Sonde	☒
Flow Cell	☒
Probe Guard	☒
Rubber Storage/Calibration	☒
Sleeve Calibration Cup + Cap	☒
YSI Pro Series ProComm II Kit	☒
Instruction Manual & Field Sheets	☒
Spare Batteries (x 2)	☒

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	$\pm 0.2^{\circ}\text{C}$	☐	☐
Dissolved Oxygen	☒ 100% Saturation	$\pm 2\%$	☐	☐
	Pressure Compensation	1015 hPa	☐	☐
Conductivity	☒ 1288mS/cm	$\pm 0.5\%$	☐	☐
	☒ Check linearity at 1.4mS/cm	$\pm 0.5\%$	☐	☐
Salinity	Auto Calibrated	$\pm 1\%$	☐	☐
pH	☒ pH 7.00	± 0.2	☐	☐
	☒ pH 4.00	± 0.2	☐	☐
ORP	☒ 238 mV at 21 $^{\circ}\text{C}$	$\pm 20\text{mV}$	☐	☐

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

ECO Environmental Equipment Specialist

Date: 08.10.2020

EQUIPMENT INFORMATION

Instrument: HC1100
Serial Number: 01-001837

Equipment Check

	Enclosed	Returned	Comment
Heron Black Water Level Meter	☒	☐	
Carry Bag	☒	☐	
Spare battery 9v	☒	☐	

Inspection Details

	Pass	Fail	Comment
De-con wash of tape (60m)	☒	☐	
De-con wash of reel	☒	☐	
Inspection for faults, corrosion, damage	☒	☐	
Meter in good working order, clean and ready for use	☒	☐	

This is to certify that where possible this instrument has been cleaned in accordance with the manufacture's general maintenance procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,



Equipment Specialist
ECO Environmental

Date: 09.10.2020

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review

PFAS Ongoing Monitoring Plan Biannual Monitoring Factual Report

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
QA Documentation	
Project Quality Plan/Work Plan and Data Quality Objectives	<p>The field investigation was carried out between the 14 and 29 October 2020 and is in accordance with the proposed scope of work, as documented in the SAQP (ref DEF19009_Report03.0_Gingin Satellite Airfield_OMP PFAS_SAQP) issued to the client and in general compliance with the Australian standards AS 4482.1-2005 "Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds", Australian Standard AS 4482-1999 <i>Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 - Volatile substances</i>; Standards Australia 1998. AS/NZ 5667:1998 <i>Water quality – sampling</i> and NEPM "National Environment Protection (Assessment of Site Contamination) Measure".</p> <p>A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the PFAS OMP 2020 Post-Winter Factual Report. In addition, a safety, health and environment work method statement (SHEWMS) was also prepared.</p> <p>The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.</p>
Data Representativeness	
Use of Composites	No Composites were used during the investigation
Holding Times	<p>Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes, with the exception of the following:</p> <ul style="list-style-type: none"> • EP2011160 <ul style="list-style-type: none"> ○ pH – 1 to 7 days overdue • EP2011490 <ul style="list-style-type: none"> ○ pH – 6 days overdue (All samples) • EP2011633 & EP2011863 <ul style="list-style-type: none"> ○ pH – 7 days overdue (All samples) <p>The holding time exceedances for pH are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.</p>
Background samples	MW137_S is located upgradient of the Site and provides background groundwater quality information.

QA/QC Aspects	Evidence & Evaluation															
Verification of field procedures	<p>The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP.</p> <p>None disposable equipment was decontaminated between sample locations.</p>															
Data Precision & Accuracy																
QC sample Frequency	<table><tr><th>QC sample type</th><th>SAQP required frequency</th><th>Sample Collected</th></tr><tr><td>Blind duplicate</td><td>1 in 10 primary samples (10%)</td><td>4 for 57 primary samples (7.0%)</td></tr><tr><td>Split duplicate</td><td>1 in 10 primary samples (10%)</td><td>4 for 57 primary samples (7.0%)</td></tr><tr><td>Rinsate</td><td>1 per dipper per day</td><td>5 for 5 days (100%)</td></tr><tr><td>Field Blank</td><td>1 per day</td><td>5 for 5 days (100%)</td></tr></table>	QC sample type	SAQP required frequency	Sample Collected	Blind duplicate	1 in 10 primary samples (10%)	4 for 57 primary samples (7.0%)	Split duplicate	1 in 10 primary samples (10%)	4 for 57 primary samples (7.0%)	Rinsate	1 per dipper per day	5 for 5 days (100%)	Field Blank	1 per day	5 for 5 days (100%)
	QC sample type	SAQP required frequency	Sample Collected													
	Blind duplicate	1 in 10 primary samples (10%)	4 for 57 primary samples (7.0%)													
	Split duplicate	1 in 10 primary samples (10%)	4 for 57 primary samples (7.0%)													
	Rinsate	1 per dipper per day	5 for 5 days (100%)													
Field Blank	1 per day	5 for 5 days (100%)														
<p>Field duplicate and triplicate samples were collected at a rate of 7%; below the target frequency of 10%. This is not considered to significantly affect the data quality as the replicate samples that were taken had acceptable RPD results.</p>																
QC Testing – Blind Replicates (Primary Lab)	<ul style="list-style-type: none">RPD Acceptance Criteria: <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <ul style="list-style-type: none">Groundwater Samples Analysed: 61 (including QC)Blind Replicate Samples Analysed: 4Number of Analyte Pairs Exceeding Criteria: 1 <p>All analyte pairs were between the acceptable RPD range with one exception. The level of RPD is minor and probably related to the low analyte concentrations of analyte pair</p>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
QC Testing – Field Splits (Secondary Lab)	<ul style="list-style-type: none">RPD Acceptance Criteria: <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <ul style="list-style-type: none">Groundwater Samples Analysed: 61 (including QC)Field Split Samples Analysed: 4Number of Analyte Pairs Exceeding Criteria: 2 <p>The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference or methodologies between the primary and secondary laboratories.</p>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
Field Blanks	<p>Field Blanks were collected at a rate of one per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.</p>															
Laboratory Internal QC	<p>Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and satisfactory results for method blank, laboratory control samples and laboratory duplicates.</p> <p>All Matrix Spikes generally reported recoveries with the acceptance range of 70% to 130% with the exception of the following:</p> <ul style="list-style-type: none">EP2011227<ul style="list-style-type: none">PFBS, PFPeS, PFHxS, PFOS, PFHxA. Client Sample ID: MW308. MS recovery not determined, background level greater than or equal to 4x spike level.EP2011490															

QA/QC Aspects	Evidence & Evaluation
	<ul style="list-style-type: none"> TOC. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. <p>The following Quality Control sample frequency non-conformance was reported:</p> <ul style="list-style-type: none"> EP2011490 <ul style="list-style-type: none"> Laboratory Duplicates: expected rate: 10%, actual: 5.71%. Matrix Spike: expected rate: 5%, actual: 2.86%. EP2011633 & EP2011863 <ul style="list-style-type: none"> Laboratory Duplicates: expected rate: 10%, actual: 0%. Matrix Spike: expected rate: 5%, actual: 0%. <p>No Method Blank value outliers were reported.</p>
Laboratory Method Detection Limit	Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.
NATA endorsement of laboratory reports	<p>Laboratory reports were stamped with the NATA endorsement stamp and signature.</p> <p>ALS Accreditation No. 825</p> <p>Eurofins Accreditation No. 1261</p>
Calibration of Field Equipment	<p>All equipment used during the investigation was calibrated by the supplier prior to use.</p> <p>The equipment calibration certificates are provided in Appendix D.</p>
Decontamination and Equipment Blanks	Rinsate blanks were collected at a rate of one per day when reusable equipment is used. All rinsate samples tested reported analytes concentrations below the laboratory LORs.
Data Comparability	
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
Data Completeness	
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- ☐ A factual report of the condition of a portion of the site or one aspect of an entire site.
- ☐ Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- ☐ Validation of the success of remediation of a site or a portion of a site.
- ☐ Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide “environmental sign-off” of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants’ duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the “hot spot” method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

PFAS OMP Quarterly Sampling Event Factual Report

January 2021

Gingin Satellite Airfield

DEF19009



Prepared for
Department of Defence

29 March 2021

Contact Information

Cardno (WA) Pty Ltd

ABN 77 009 119 000

11 Harvest Terrace
West Perth WA 6005
Australia

www.cardno.com

Phone +61 8 9273 3888

Fax +61 8 9486 8664

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

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Chemical Names

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

Technical Terms

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

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre

ppm Parts per Million

 μ S/cm Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

OMP Ongoing Monitoring Plan

FTG Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) at Royal Australian Air force (RAAF) Gingin Satellite Airfield (“the site”). The site is located in Yeal, Western Australia and is displayed in Figure 1 of Appendix A.

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

- > Cardno, 11 May 2020, Reference: DEF19009, ‘PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Gingin Satellite Airfield’.

The SAQP was reviewed prior to the sampling event and no changes related to the quarterly monitoring event were made.

For the purposes of this report:

- > Management Area was defined as Gingin Satellite Airfield (Figure 1, Appendix A).
- > Monitoring Area was defined as comprising the Site, plus the parcel of Crown Land that represents the Yeal Swamp Nature Reserve – an area that surrounds much of the southern, western and northern extent of the Base. The lateral extents of the Monitoring Area are aligned with the boundary of the adjoining Crown Lands property (Figure 1, Appendix A).

1.2 Purpose & Objectives

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

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

The objectives of the report are:

- > To provide a succinct summary of the Q1 2021 sampling event and provision of analytical results with supporting tables and figures.
- > To provide confirmation of the current understanding of risk.
- > To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

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

- > National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).
- > Heads of Environmental Protection Authority’s Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.
- > Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.
- > Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

- > Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites¹.
- > Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > National Health and Medical Research Council (NHMR), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

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

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in accordance with the SAQP (Cardno, 2020), applying methods set out in section 3 of this report. The groundwater bores monitored as part of the OMP quarterly monitoring event are presented in Table 2-1, and are shown on Figure 2, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
On-Site Abstraction wells	0958_MW401; 0958_MW402
Off-Site wells - South	0958_MW141_S; 0958_MW142_S; 0958_MW143_S; 0958_MW403
Off-Site Abstraction wells ⁽¹⁾	Pinjar Production P140, Pinjar Production P145.
Note: (1) These are Water Corporation production bores being sampled by the Water Corporation.	

2.2 Tap Water Monitoring

Water samples were collected from the tap water monitoring locations listed in Table 2-2 in accordance with the SAQP (Cardno, 2020) and sampling methodology detailed in section 3.2. The tap water monitoring locations are shown on Figure 2, Appendix A.

Table 2-2 Tap Water Monitoring Locations

Monitoring Area	Location ID
On-Site	0958_POT101; 0958_POT102; 0958_POT103; 0958_POT104; 0958_POT105.

2.3 Data Management

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

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

2.3.1 Defence ESdat database

Data collected as part of the Q1 2021 OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- > All field data collected was uploaded;

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

- > Laboratory data was uploaded and approved; and
- > QA/QC data was reconciled.

2.4 Deviations from the OMP SAQP

The following deviation from the SAQP was reported:

- > Monitoring Bore MW143_S was not sampled as this monitoring location was found dry.
- > Access to the abstraction bore 2 (MW402) compound for sampling was denied due to the presence of Amoebae in water.
- > No sampling of bores P140 and P145 has been undertaken.

No other deviation from the SAQP was reported during the January 2021 sampling event.

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken by no purge HydraSleeve® method as detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Groundwater Field Parameters	<p>Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) were calibrated by the equipment supplier to optimise the accuracy of the measurements taken. Calibration certificates are provided in Appendix D.</p>
Deployment of HydraSleeve	<p>HydraSleeve were deployed with top weight sample collection to begin at the lowest point.</p>
Retrieval of HydraSleeves (Sample Collection)	<p>HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment. Samples were collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples were discharged immediately (minimise changes in chemistry) via discharge tube.</p> <p>Following sampling, hydrasleeves were deployed in preparation for the next OMP monitoring event using the same string for consistency between event (same depth of sampling i.e. within screen).</p>
Decontamination procedure	<p>Dedicated HydraSleeves were used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p>

Activity	Details
	Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	<p>Groundwater samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. <p>The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix C.</p>

3.2 Tap water Sampling Methodology

Water samples from abstraction bores and taps were collected via the 'first flush' sampling method. The primary objective of the 'first flush' sampling method is to collect water representative of the user, who may not purge the water line.

Field parameters (pH, temperature, EC, ORP and DO) were recorded post sampling collection via flow cell, samples were analysed for the same analytical suite as the groundwater monitoring wells.

3.3 Quality Control / Quality Assurance

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

- > QA documentation.
- > Bias.
- > Data Representativeness.
- > Data Precision & Accuracy.
- > Laboratory Performance.
- > Data Comparability.
- > Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E. The data quality review indicates no significant systematic errors in the data collection process for groundwater and tap water and therefore, the data set used as the basis for this assessment is considered valid and complete.

3.4 Assessment Criteria

3.4.1 Groundwater and Tap water

The adopted assessment criteria for groundwater and tap water are detailed in Table 3-2.

Table 3-2 Criteria for Groundwater and Tap water

Exposure Scenario	Adopted Assessment Criteria		
	PFHxS / PFOS µg/L	PFOA	Guidance
Human Health - Drinking Water Quality Guideline	0.07	0.56	HEPA 2020
Human Health – Recreational Use Guideline	2.0	10	HEPA 2020

4 Field Observations and Results

4.1 Groundwater

4.1.1 Summary of Field Observations

4.1.1.1 Physicochemical parameters

Stabilised physicochemical parameters, water colour and turbidity observations recorded during the groundwater and tap water sampling event are presented in field sampling records, included in Appendix D.

4.1.1.2 Groundwater gauging

Groundwater depth ranged from 52.68 mAHD (MW403) to 63.21 mAHD (MW141_S) which is consistent with historical data. Gauging records are presented in Appendix D.

4.1.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figure 2 in Appendix A presents the groundwater monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	0.56 ²	0.04 (MW141S)	4	0
Sum of PFHxS and PFOS	MW141_S, MW402	0.07 ²	0.83 (MW141S)	4	1

Note:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > No new exceedances of guideline values or first time detection of PFOA or Sum of PFOS and PFHxS were reported at any groundwater sampling locations during the January 2021 quarterly monitoring event.
- > No further sampling of bores P140 and P145 has been undertaken since June 2019 as the Water Corporation has been developing and finalising a PFAS response protocol.

4.2 Tap water

4.2.1 Summary of Field Observations

Stabilised physicochemical parameters and observations recorded during the tap water sampling event are presented in field sampling records, included in Appendix D.

4.2.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figure 2 in Appendix A presents the tap water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Tap Water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	0.56 ²	0.03	5	0
Sum of PFHxS and PFOS	POT101, POT102, POT103, POT104, POT105	0.07 ²	0.80 (POT104)	5	5

Note:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > No first time detect of PFOA or Sum of PFOS and PFHxS were reported for the tap water locations.
- > All five tap water samples reported Sum of PFOS and PFHxS concentrations above the drinking water guideline value but below the recreational use value, which is similar to previous monitoring events.
- > All samples reported a detectable concentration of PFOA (i.e. above laboratory LOR) but below the adopted assessment criteria.

4.3 Changes to the Monitoring Network Condition

Abstraction bore 2 (MW402) tap was tagged off due to the presence of Amoebae detected in water (BroadSpectrum communication to Cardno, 28/01/21).

5 Summary and Conclusions

Cardno undertook the January 2021 quarterly groundwater and tap water monitoring event at Gingin Satellite Airfield as part of the PFAS OMP. Groundwater sampling and testing was undertaken at three (3) monitoring wells on- and off-Site, one abstraction bore and five tap water locations. One groundwater monitoring well couldn't be sampled as this well was found to be dry and one abstraction bore couldn't be accessed.

The groundwater laboratory results reported the following:

- > Of the four groundwater samples tested, Sum of PFOS and PFHxS (1 sample) reported an exceedance of the assessment criteria.
- > No exceedances of the guideline values for PFOA were reported for the groundwater samples.
- > No first time detect or new exceedance of guideline values were reported for the quarterly groundwater monitoring locations.
- > Groundwater results were generally consistent with the previous monitoring events.

The tap water laboratory results reported the following:

- > All five (5) samples tested reported Sum of PFOS and PFHxS concentrations above the drinking water criteria but below the recreational use criteria, which is similar to the previous monitoring event.
- > All five (5) samples reported PFOA concentrations above the laboratory LOR but below the adopted assessment criteria.
- > No first time detect or new exceedance of guideline values were reported for the tap water monitoring locations.

PFAS concentrations at the groundwater and tap water locations sampled during the 2020 Q1 monitoring event were generally of the same magnitude of order as historical events.

The next OMP sampling event for Gingin Satellite Airfield is the biannual monitoring event (post summer 2021), scheduled for April 2021.

6 References

General References

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2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
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7. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (<https://maps.water.wa.gov.au/#/webmap/gwm>).
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11. National Health and Medical Research Council (NHMRC) (2011 – updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
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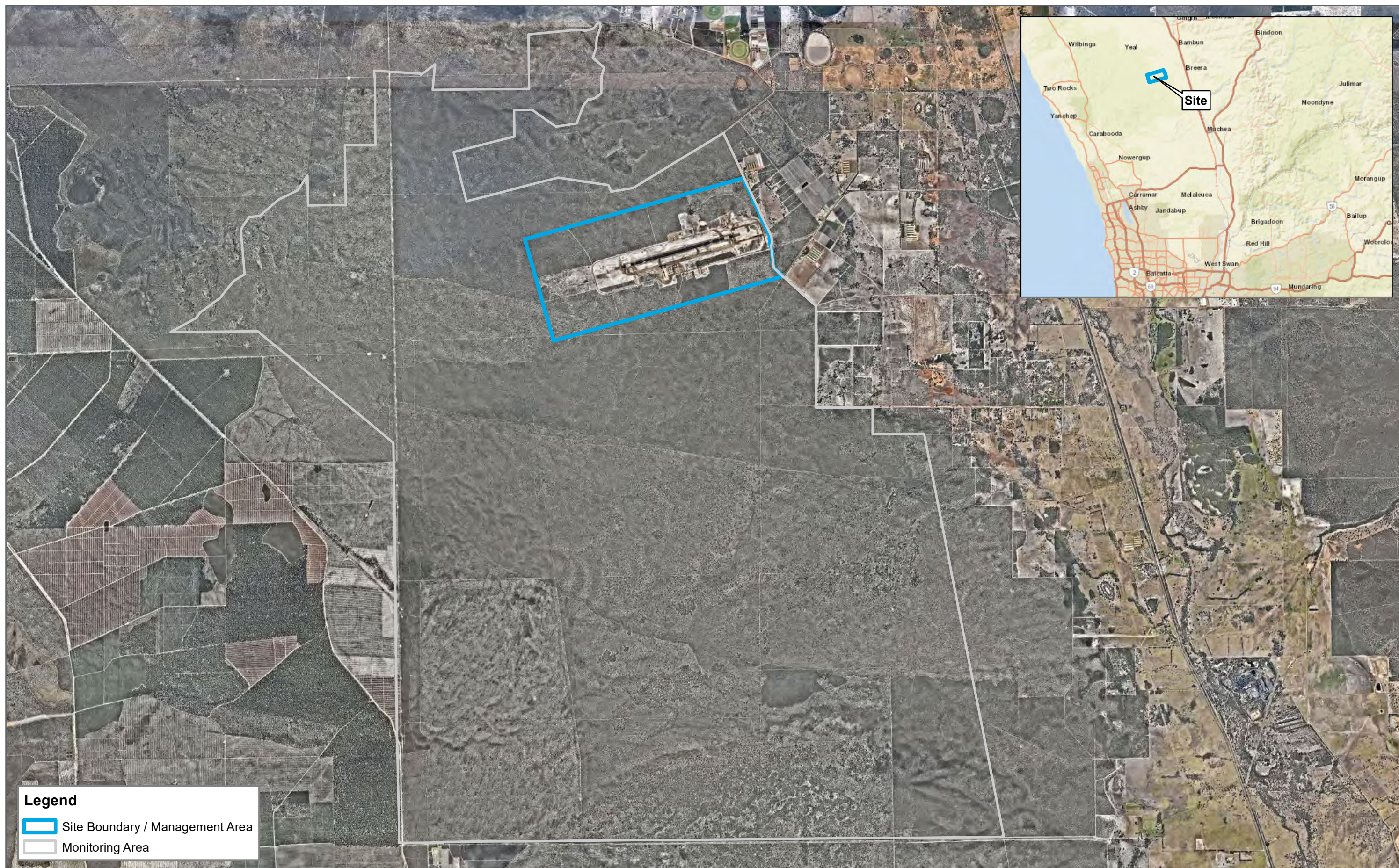
Site Specific References

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18. Cardno, December 2020, PFAS OMP, Biannual Monitoring Factual Report - August 2020.
19. Cardno, December 2020, PFAS OMP, Biannual Monitoring Factual Report – post-winter 2020.
20. Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.
21. Department of Defence, 2018b, Gingin Satellite Airfield PFAS Investigation, PFAS Management Area Plan
22. Jacobs, 2018a, Preliminary Conceptual Site Model - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0001).
23. Jacobs, 2018b, Sampling, Analysis and Quality Plan - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0002).
24. Jacobs, 2018c, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0003).
25. Jacobs, 2018d, Tier 2 Human Health Risk Assessment – Offsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0005).
26. Jacobs, 2018e, Tier 3 Human Health Risk Assessment – Onsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0006).
27. Jacobs, 2019, PFAS Ongoing Groundwater Monitoring Report (No. IS219200-0000-NP-RPT-0008).

APPENDIX

A

FIGURES



Legend

Site Boundary / Management Area

Monitoring Area

FIGURE 1
1:60,000 Scale at A3

Meters

0 1,000 2,000

Site Location

QUARTERLY SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
 Date: 2021-06-12 | Project: DEF19009
 Coordinate System: GDA 1994 MGA Zone 50
 Map: DEF19009_WA_0958-GS-001_RegionalLocation 02.mxd
 Aerial Imagery Supplied by Nearmap

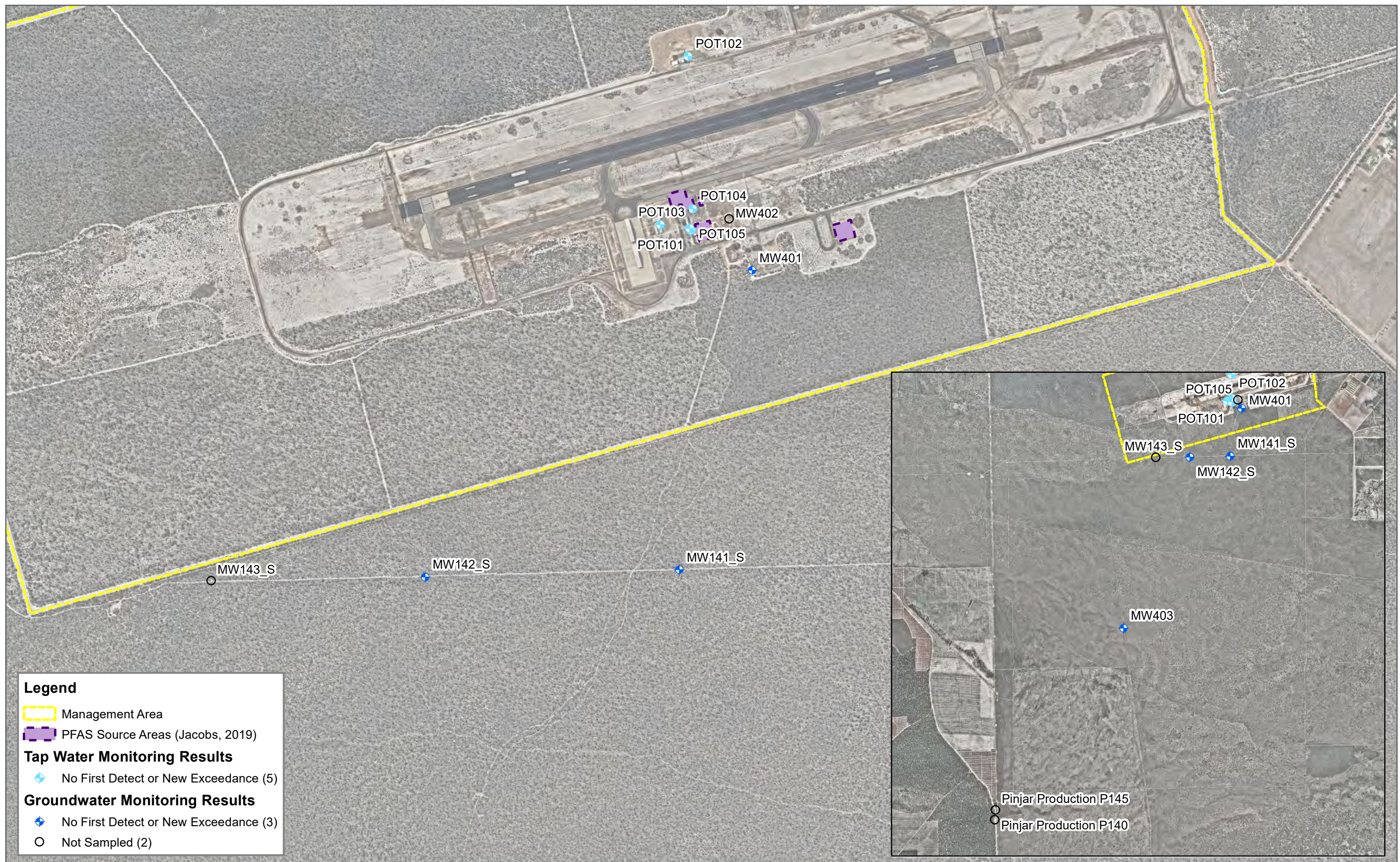


FIGURE 2
1:11,000 Scale at A3

Meters
0 200 400

Monitoring Locations & Results Summary

QUARTERLY SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-002_2021Q1PFASResults 01.mxd
Aerial Imagery Supplied by Nearmap (March 2020)

APPENDIX

B

DATA ASSESSMENT TABLES

					Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids												(n:2)
					Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting					0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	
Human Health - Drinking Water criteria (PFAS NEMP, HEPA 2020)															0.56								
Human Health - Recreational Use criteria (PFAS NEMP, HEPA 2020)															10								
Lab Report No.	Field ID	Location Code	Date	Sample Type																			
EP2100912	0958_MW141_210128	MW141_S	28/01/2021	Normal	0.06	0.07	0.62	0.04	0.21	<0.02	<0.1	0.15	0.02	0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_MW142_210128	MW142_S	28/01/2021	Normal	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_MW401_210128	MW401	28/01/2021	Normal	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_MW403_210128	MW403	28/01/2021	Normal	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_POT101_210128	POT101	28/01/2021	Normal	0.07	0.07	0.48	0.03	0.19	<0.02	<0.1	0.14	0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_POT102_210128	POT102	28/01/2021	Normal	0.08	0.08	0.53	0.03	0.22	<0.02	<0.1	0.14	0.03	<0.02	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_POT103_210128	POT103	28/01/2021	Normal	0.03	0.03	0.18	<0.02	0.07	<0.02	<0.1	0.06	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_POT104_210128	POT104	28/01/2021	Normal	0.08	0.08	0.57	0.04	0.23	<0.02	<0.1	0.15	0.03	<0.02	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_POT105_210128	POT105	28/01/2021	Normal	0.08	0.07	0.50	0.03	0.19	<0.02	<0.1	0.13	0.03	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_QC301_210128		28/01/2021	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
EP2100912	0958_QC401_210128		28/01/2021	Field Blank	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	
Notes:																							
First Time detect of PFOA or PFHxS+PFOS																							
New exceedance of guideline value																							

Table 1: Summary of Analytical Results

					Fluorotelomer Sulfonic Acids			Perfluoroalkyl Sulfonamides							PFAS		
					6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)_	Sum of PFHxS and PFOS	Sum of PFAS
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting					0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
Human Health - Drinking Water criteria (PFAS NEMP, HEPA 2020)															0.07		
Human Health - Recreational Use criteria (PFAS NEMP, HEPA 2020)															2		
Lab Report No.	Field ID	Location Code	Date	Sample Type													
EP2100912	0958_MW141_210128	MW141_S	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.12	0.83	1.23
EP2100912	0958_MW142_210128	MW142_S	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2100912	0958_MW401_210128	MW401	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2100912	0958_MW403_210128	MW403	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2100912	0958_POT101_210128	POT101	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.92	0.67	1.02
EP2100912	0958_POT102_210128	POT102	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.03	0.75	1.14
EP2100912	0958_POT103_210128	POT103	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.35	0.25	0.38
EP2100912	0958_POT104_210128	POT104	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.09	0.80	1.21
EP2100912	0958_POT105_210128	POT105	28/01/2021	Normal	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.95	0.69	1.05
EP2100912	0958_QC301_210128		28/01/2021	Rinsate	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2100912	0958_QC401_210128		28/01/2021	Field Blank	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
Notes:																	
First Time detect of PFOA or PFHxS+PFOS																	
New exceedance of guideline value																	

					Inorganics															Organic	
					Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Calcium (filtered)	Chloride	Ionic Balance	Magnesium (filtered)	pH (Lab)	Potassium (filtered)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Dissolved Organic Carbon
					mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	mg/L	%	mg/L	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting					1	1	1	1	0.01	0.01	1	1	0.01	1	0.01	1	1	1	10	5	1
Human Health - Drinking Water criteria (PFAS NEMP, HEPA 2020)																					
Human Health - Recreational Use criteria (PFAS NEMP, HEPA 2020)																					
Lab Report No.	Field ID	Location Code	Date	Sample Type																	
EP2100912	0958_MW141_210128	MW141_S	28/01/2021	Normal	<1	<1	<1	<1	1.93	2.29	2	53	-	7	4.66	2	36	21	206	9	44
EP2100912	0958_MW142_210128	MW142_S	28/01/2021	Normal	<1	<1	<1	<1	1.47	1.90	<1	52	-	4	4.17	2	35	<1	198	52	48
EP2100912	0958_MW401_210128	MW401	28/01/2021	Normal	<1	13	<1	13	1.46	1.40	<1	42	2.16	3	6.43	1	26	1	81	16	6
EP2100912	0958_MW403_210128	MW403	28/01/2021	Normal	<1	2	<1	2	3.04	3.17	2	91	1.99	6	5.83	2	58	21	170	8	3
EP2100912	0958_POT101_210128	POT101	28/01/2021	Normal	<1	39	<1	39	4.73	4.09	<1	140	7.26	<1	7.31	<1	94	<1	234	<5	4
EP2100912	0958_POT102_210128	POT102	28/01/2021	Normal	<1	39	<1	39	5.02	4.48	<1	149	5.72	<1	7.47	<1	103	2	262	<5	6
EP2100912	0958_POT103_210128	POT103	28/01/2021	Normal	<1	64	<1	64	5.71	4.83	5	154	8.28	2	7.24	1	101	4	286	<5	2
EP2100912	0958_POT104_210128	POT104	28/01/2021	Normal	<1	34	<1	34	5.76	5.18	<1	178	5.36	<1	7.23	<1	119	3	290	<5	6
EP2100912	0958_POT105_210128	POT105	28/01/2021	Normal	<1	33	<1	33	6.19	5.39	<1	194	6.91	<1	7.36	<1	124	3	315	<5	5
EP2100912	0958_QC301_210128		28/01/2021	Rinsate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EP2100912	0958_QC401_210128		28/01/2021	Field Blank	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Notes:																					
					First Time detect of PFOA or PFHxS+PFOS																
					New exceedance of guideline value																

Field ID		0958_MW141_210128	0958_QC102_210128		0958_MW141_210128	0958_QC202_210128		0958_MW401_210128	0958_QC101_210128		0958_MW401_210128	0958_QC201_210128		
Matrix Type		Water	Water		Water	Water		Water	Water					
Lab Report Number		EP2100912	EP2100912		EP2100912	770820		EP2100912	EP2100912					
Date		28/01/2021	28/01/2021		28/01/2021	28/01/2020		28/01/2021	28/01/2021					
Date		28/01/2021	28/01/2021	RPD	28/01/2021	28/01/2020	RPD	28/01/2021	28/01/2021	RPD	28/01/2021	28/01/2020	RPD	
	Unit	LOR												
Perfluoroalkane Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01				0.02						<0.01		
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.06	0.06	0	0.06	0.06	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.07	0.07	0	0.07	0.08	13	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.62	0.61	2	0.62	0.61	2	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.04	0.04	0	0.04	0.05	22	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.21	0.21	0	0.21	0.31	38	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01				<0.01						<0.01		
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroalkane Carboxylic Acids														
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.15	0.15	0	0.15	0.14	7	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.02	0.02	0	0.02	0.04	67	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.02	0.02	0	0.02	0.02	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.04	0.04	0	0.04	0.04	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
(n:2) Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluoroalkyl Sulfonamides														
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS														
Sum of PFAS (WA DER List)_	µg/L	0.01	1.12	1.11	1	1.12	1.22	9	<0.01	<0.01	0	<0.01	<0.05	0
Sum of PFHxS and PFOS	µg/L	0.01	0.83	0.82	1	0.83	0.92	10	<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS	µg/L	0.01	1.23	1.22	1	1.23	1.37	11	<0.01	<0.01	0	<0.01	<0.1	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					0.96						<0.01	
Organic														
Dissolved Organic Carbon	mg/L	1	44	46	4	44			6	6	0	6		
Dissolved Organic Carbon (filtered)	mg/L	5					42						<5	

LOR: Limit of Reporting

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

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

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

APPENDIX

C

LABORATORY CERTIFICATES OF ANALYSIS



ALS Use Only

Custody Document for Submissions via ALS Compass App

Project: WA_0958_PFA507D Client: CARDNO

Project Manager: [REDACTED]

Phone: [REDACTED]

ALS Compass COC Reference: 18345 # Samples: 13

Sampler: [REDACTED]

Phone: [REDACTED]

Turnaround Requirements: Standard Urgent

Special Instructions: Please send QC201 & QC202 to Eurofins.

Custody:

Relinquished by: [REDACTED]

Received: [REDACTED]

Relinquished by: [REDACTED]

Received by: [REDACTED]

Date / Time: 28/01/21

Date / Time: 20/1 1515

Date / Time: [REDACTED]

Date / Time: [REDACTED]

Environmental Division
Perth
Work Order Reference
EP2100912



Telephone: 61-8-9406 1301



CHAIN OF CUSTODY

COC#: 18345 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - GW 2021 Q1

ORDER NO: DEF19009/330

PROJECT MANAGER:

CONTACT PH:

SAMPLER MOBILE:

PRIMARY SAMPLER:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW141		28/01/2021 01:52 PM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_QC102		28/01/2021 01:55 PM	Water	ALS: 4 Non ALS: 0	No	X			
003	0958_MW403		28/01/2021 01:57 PM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_MW142		28/01/2021 01:59 PM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_MW401		28/01/2021 02:00 PM	Water	ALS: 6 Non ALS: 0	No	X			Lab QC
006	0958_POT103		28/01/2021 02:02 PM	Water	ALS: 4 Non ALS: 0	No	X			
007	0958_POT102		28/01/2021 02:03 PM	Water	ALS: 4 Non ALS: 0	No	X			
008	0958_POT104		28/01/2021 02:05 PM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_POT101		28/01/2021 02:06 PM	Water	ALS: 4 Non ALS: 0	No	X			



CHAIN OF CUSTODY

COC#: 18345

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - GW 2021 Q1

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_POT105		28/01/2021 02:08 PM	Water	ALS: 4 Non ALS: 0	No	X			
011	0958_QC101		28/01/2021 02:10 PM	Water	ALS: 4 Non ALS: 0	No	X			
012	0958_QC301		28/01/2021 02:15 PM	Water	ALS: 2 Non ALS: 0	No		X		
013	0958_QC401		28/01/2021 02:16 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

COC#: 18345

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - GW 2021 Q1

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

007	0958_POT102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023620	Purple	No	
007	0958_POT102	HDPE (no PTFE)	20 mL	00352005006705	Grey	No	
007	0958_POT102	HDPE (no PTFE)	20 mL	00352005007524	Grey	No	
007	0958_POT102	Clear Plastic Bottle - Natural	250 mL	00071119091362	Green	No	
008	0958_POT104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023662	Purple	No	
008	0958_POT104	HDPE (no PTFE)	20 mL	00352005002563	Grey	No	
008	0958_POT104	HDPE (no PTFE)	20 mL	00352005005044	Grey	No	
008	0958_POT104	Clear Plastic Bottle - Natural	250 mL	00071119091295	Green	No	
009	0958_POT101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023646	Purple	No	
009	0958_POT101	HDPE (no PTFE)	20 mL	00352005006589	Grey	No	
009	0958_POT101	HDPE (no PTFE)	20 mL	00352005006657	Grey	No	
009	0958_POT101	Clear Plastic Bottle - Natural	250 mL	00071119091239	Green	No	
010	0958_POT105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023630	Purple	No	
010	0958_POT105	HDPE (no PTFE)	20 mL	00352005006754	Grey	No	
010	0958_POT105	HDPE (no PTFE)	20 mL	00352005006831	Grey	No	
010	0958_POT105	Clear Plastic Bottle - Natural	250 mL	00071119091320	Green	No	
011	0958_QC101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058027	Purple	No	
011	0958_QC101	HDPE (no PTFE)	20 mL	00352005006277	Grey	No	
011	0958_QC101	HDPE (no PTFE)	20 mL	00352005006341	Grey	No	
011	0958_QC101	Clear Plastic Bottle - Natural	250 mL	00070719062387	Green	No	
012	0958_QC301	HDPE (no PTFE)	20 mL	00350019011743	Grey	No	
012	0958_QC301	HDPE (no PTFE)	20 mL	00350019015166	Grey	No	
013	0958_QC401	HDPE (no PTFE)	20 mL	00350019041132	Grey	No	
013	0958_QC401	HDPE (no PTFE)	20 mL	00350019041067	Grey	No	

Total Bottle Count: ALS: 50, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2100912**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: [REDACTED]@cardno.com.au	E-mail	: [REDACTED]@alsglobal.com
Telephone	: ----	Telephone	: [REDACTED]
Facsimile	: ----	Facsimile	: [REDACTED]
Project	: WA_0958_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/330	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 18345	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Gingin		
Sampler	: [REDACTED]		

Dates

Date Samples Received	: 28-Jan-2021 15:15	Issue Date	: 28-Jan-2021
Client Requested Due Date	: 09-Feb-2021	Scheduled Reporting Date	: 09-Feb-2021

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 19.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 13 / 13

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2100912-001	28-Jan-2021 13:52	0958_MW141_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-002	28-Jan-2021 13:55	0958_QC102_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-003	28-Jan-2021 13:57	0958_MW403_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-004	28-Jan-2021 13:59	0958_MW142_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-005	28-Jan-2021 14:00	0958_MW401_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-006	28-Jan-2021 14:02	0958_POT103_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-007	28-Jan-2021 14:03	0958_POT102_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-008	28-Jan-2021 14:05	0958_POT104_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-009	28-Jan-2021 14:06	0958_POT101_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-010	28-Jan-2021 14:08	0958_POT105_210128	✓	✓	✓	✓	✓	✓	✓
EP2100912-011	28-Jan-2021 14:10	0958_QC101_210128	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2100912-001	28-Jan-2021 13:52	0958_MW141_210128	✓
EP2100912-002	28-Jan-2021 13:55	0958_QC102_210128	✓
EP2100912-003	28-Jan-2021 13:57	0958_MW403_210128	✓
EP2100912-004	28-Jan-2021 13:59	0958_MW142_210128	✓
EP2100912-005	28-Jan-2021 14:00	0958_MW401_210128	✓
EP2100912-006	28-Jan-2021 14:02	0958_POT103_210128	✓
EP2100912-007	28-Jan-2021 14:03	0958_POT102_210128	✓
EP2100912-008	28-Jan-2021 14:05	0958_POT104_210128	✓
EP2100912-009	28-Jan-2021 14:06	0958_POT101_210128	✓
EP2100912-010	28-Jan-2021 14:08	0958_POT105_210128	✓
EP2100912-011	28-Jan-2021 14:10	0958_QC101_210128	✓
EP2100912-012	28-Jan-2021 14:15	0958_QC301_210128	✓
EP2100912-013	28-Jan-2021 14:16	0958_QC401_210128	✓



Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)

Email

[REDACTED]

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)

Email

[REDACTED]

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

Email

[REDACTED] cardno.com.au

Email

[REDACTED] cardno.com.au

Email

[REDACTED] cardno.com.au

Email

[REDACTED] cardno.com.au

Email

[REDACTED] cardno.com.au

Email

[REDACTED] cardno.com.au

Email

[REDACTED] cardno.com.au

Email

[REDACTED] cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2100912**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 18345
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 13
No. of samples analysed : 13

Page : 1 of 14
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 28-Jan-2021 15:15
Date Analysis Commenced : 29-Jan-2021
Issue Date : 04-Feb-2021 14:48



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW141_210128	0958_QC102_210128	0958_MW403_210128	0958_MW142_210128	0958_MW401_210128
Sampling date / time				28-Jan-2021 13:52	28-Jan-2021 13:55	28-Jan-2021 13:57	28-Jan-2021 13:59	28-Jan-2021 14:00
Compound	CAS Number	LOR	Unit	EP2100912-001	EP2100912-002	EP2100912-003	EP2100912-004	EP2100912-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	4.66	4.73	5.83	4.17	6.43
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	206	202	170	198	81
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	9	12	8	52	16
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	<1	<1	2	<1	13
Total Alkalinity as CaCO ₃	----	1	mg/L	<1	<1	2	<1	13
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	21	19	21	<1	1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	53	54	91	52	42
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	1	2	<1	<1
Magnesium	7439-95-4	1	mg/L	7	7	6	4	3
Sodium	7440-23-5	1	mg/L	36	35	58	35	26
Potassium	7440-09-7	1	mg/L	2	2	2	2	1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.93	1.92	3.04	1.47	1.46
∅ Total Cations	----	0.01	meq/L	2.29	2.20	3.17	1.90	1.40
∅ Ionic Balance	----	0.01	%	----	----	1.99	----	2.16
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	44	46	3	48	6
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.06	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	0.07	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.62	0.61	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.04	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW141_210128	0958_QC102_210128	0958_MW403_210128	0958_MW142_210128	0958_MW401_210128
Sampling date / time				28-Jan-2021 13:52	28-Jan-2021 13:55	28-Jan-2021 13:57	28-Jan-2021 13:59	28-Jan-2021 14:00
Compound	CAS Number	LOR	Unit	EP2100912-001	EP2100912-002	EP2100912-003	EP2100912-004	EP2100912-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.21	0.21	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.02	0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.15	0.15	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.02	0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW141_210128	0958_QC102_210128	0958_MW403_210128	0958_MW142_210128	0958_MW401_210128
Sampling date / time				28-Jan-2021 13:52	28-Jan-2021 13:55	28-Jan-2021 13:57	28-Jan-2021 13:59	28-Jan-2021 14:00
Compound	CAS Number	LOR	Unit	EP2100912-001	EP2100912-002	EP2100912-003	EP2100912-004	EP2100912-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.23	1.22	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.83	0.82	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.12	1.11	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	108	112	108	109	110
13C8-PFOA	----	0.02	%	109	108	110	112	111



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_POT103_21012 8	0958_POT102_21012 8	0958_POT104_21012 8	0958_POT101_21012 8	0958_POT105_21012 8
Sampling date / time				28-Jan-2021 14:02	28-Jan-2021 14:03	28-Jan-2021 14:05	28-Jan-2021 14:06	28-Jan-2021 14:08
Compound	CAS Number	LOR	Unit	EP2100912-006	EP2100912-007	EP2100912-008	EP2100912-009	EP2100912-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.24	7.47	7.23	7.31	7.36
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	286	262	290	234	315
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	64	39	34	39	33
Total Alkalinity as CaCO3	----	1	mg/L	64	39	34	39	33
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	4	2	3	<1	3
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	154	149	178	140	194
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	5	<1	<1	<1	<1
Magnesium	7439-95-4	1	mg/L	2	<1	<1	<1	<1
Sodium	7440-23-5	1	mg/L	101	103	119	94	124
Potassium	7440-09-7	1	mg/L	1	<1	<1	<1	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	5.71	5.02	5.76	4.73	6.19
∅ Total Cations	----	0.01	meq/L	4.83	4.48	5.18	4.09	5.39
∅ Ionic Balance	----	0.01	%	8.28	5.72	5.36	7.26	6.91
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	6	6	4	5
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	0.08	0.08	0.07	0.08
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.03	0.08	0.08	0.07	0.07
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.18	0.53	0.57	0.48	0.50
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.03	0.04	0.03	0.03



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_POT103_21012 8	0958_POT102_21012 8	0958_POT104_21012 8	0958_POT101_21012 8	0958_POT105_21012 8
Sampling date / time				28-Jan-2021 14:02	28-Jan-2021 14:03	28-Jan-2021 14:05	28-Jan-2021 14:06	28-Jan-2021 14:08
Compound	CAS Number	LOR	Unit	EP2100912-006	EP2100912-007	EP2100912-008	EP2100912-009	EP2100912-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.07	0.22	0.23	0.19	0.19
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.03	0.03	0.02	0.03
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.06	0.14	0.15	0.14	0.13
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	0.03	0.03	0.02	0.02
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_POT103_21012 8	0958_POT102_21012 8	0958_POT104_21012 8	0958_POT101_21012 8	0958_POT105_21012 8
Sampling date / time				28-Jan-2021 14:02	28-Jan-2021 14:03	28-Jan-2021 14:05	28-Jan-2021 14:06	28-Jan-2021 14:08
Compound	CAS Number	LOR	Unit	EP2100912-006	EP2100912-007	EP2100912-008	EP2100912-009	EP2100912-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.38	1.14	1.21	1.02	1.05
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.25	0.75	0.80	0.67	0.69
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.35	1.03	1.09	0.92	0.95
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	109	109	112	106	106
13C8-PFOA	----	0.02	%	107	109	106	104	107



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0958_QC101_210128	----	----	----	----
Sampling date / time				28-Jan-2021 14:10	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2100912-011	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.36	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	86	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	24	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	14	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	14	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	42	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
Magnesium	7439-95-4	1	mg/L	3	----	----	----	----
Sodium	7440-23-5	1	mg/L	26	----	----	----	----
Potassium	7440-09-7	1	mg/L	1	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.46	----	----	----	----
∅ Total Cations	----	0.01	meq/L	1.40	----	----	----	----
∅ Ionic Balance	----	0.01	%	2.13	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0958_QC101_210128

Sampling date / time

28-Jan-2021 14:10

Compound

CAS Number

LOR

Unit

EP2100912-011

Result

EP231A: Perfluoroalkyl Sulfonic Acids - Continued

Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0958_QC101_210128	----	----	----	----
Sampling date / time				28-Jan-2021 14:10	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2100912-011	-----	-----	-----	-----	-----
Result				----	----	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	113	----	----	----	----	----
13C8-PFOA	----	0.02	%	108	----	----	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_QC301_210128	0958_QC401_210128	----	----	----
Sampling date / time				28-Jan-2021 14:15	28-Jan-2021 14:16	----	----	----
Compound	CAS Number	LOR	Unit	EP2100912-012	EP2100912-013	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_QC301_210128	0958_QC401_210128	----	----	----
Sampling date / time				28-Jan-2021 14:15	28-Jan-2021 14:16	----	----	----
Compound	CAS Number	LOR	Unit	EP2100912-012	EP2100912-013	-----	-----	-----
Result				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	109	109	----	----	----
13C8-PFOA	----	0.02	%	104	106	----	----	----



Surrogate Control Limits

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

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

QUALITY CONTROL REPORT

Work Order	: EP2100912	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Jan-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 29-Jan-2021
C-O-C number	: 18345	Issue Date	: 04-Feb-2021
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 13		
No. of samples analysed	: 13		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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

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

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

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

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3485234)									
EP2100912-001	0958_MW141_210128	EA005-P: pH Value	----	0.01	pH Unit	4.66	4.58	1.73	0% - 20%
EP2100936-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.75	7.78	0.386	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3487179)									
EP2100912-001	0958_MW141_210128	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	206	215	4.52	0% - 20%
EP2100912-009	0958_POT101_210128	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	234	241	2.73	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3487180)									
EP2100912-001	0958_MW141_210128	EA025H: Suspended Solids (SS)	----	5	mg/L	9	8	14.5	No Limit
EP2100912-011	0958_QC101_210128	EA025H: Suspended Solids (SS)	----	5	mg/L	24	21	11.2	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3485233)									
EP2100912-001	0958_MW141_210128	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.00	No Limit
EP2100936-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	384	351	9.19	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	384	351	9.19	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3485607)									
EP2100912-001	0958_MW141_210128	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	21	21	0.00	0% - 20%
EP2100912-011	0958_QC101_210128	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3485608)									
EP2100912-001	0958_MW141_210128	ED045G: Chloride	16887-00-6	1	mg/L	53	53	0.00	0% - 20%
EP2100912-011	0958_QC101_210128	ED045G: Chloride	16887-00-6	1	mg/L	42	42	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3485296)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3485296) - continued									
EP2100908-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	53	53	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	87	87	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	960	948	1.18	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	53	52	0.00	0% - 20%
EP2100908-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	5	5	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	788	784	0.530	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	273	271	0.688	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3485297)									
EP2100912-005	0958_MW401_210128	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	3	3	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	26	26	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
EP2100935-003	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	42	40	4.75	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	2	2	0.00	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3493051)									
EP2100905-015	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	16	16	0.00	0% - 50%
EP2100912-010	0958_POT105_210128	EP002: Dissolved Organic Carbon	----	1	mg/L	5	5	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3490352)									
EP2100912-005	0958_MW401_210128	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3490352)									
EP2100912-005	0958_MW401_210128	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTeDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit

Page : 4 of 7
 Work Order : EP2100912
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3490352)									
EP2100912-005	0958_MW401_210128	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3490352)									
EP2100912-005	0958_MW401_210128	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3490352)									
EP2100912-005	0958_MW401_210128	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3485234)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3487179)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3487180)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	102	89.1	120
				<5	1000 mg/L	108	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3485233)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	100	81.2	126
				<1	200 mg/L	95.0	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3485607)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	103	87.7	113
				<1	500 mg/L	97.7	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3485608)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	101	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3485296)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	102	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.9	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.5	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3485297)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.1	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.1	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.8	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.0	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3493051)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	96.3	73.2	116



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3490352)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	82.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	83.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	81.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	87.4	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	84.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	91.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3490352)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	87.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	92.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	88.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	91.0	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	91.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	91.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.6	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	90.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	91.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	94.7	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3490352)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	82.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	91.5	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	81.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	82.6	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	118	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	87.2	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	90.2	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3490352)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	78.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	80.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	95.0	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	86.6	71.4	144

Matrix Spike (MS) Report



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

Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3485607)							
EP2100912-001	0958_MW141_210128	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	109	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3485608)							
EP2100912-001	0958_MW141_210128	ED045G: Chloride	16887-00-6	1000 mg/L	97.9	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3493051)							
EP2100912-001	0958_MW141_210128	EP002: Dissolved Organic Carbon	----	100 mg/L	106	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2100912	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Jan-2021
Site	: DEF19009/Gingin	Issue Date	: 04-Feb-2021
Sampler	: [REDACTED]	No. of samples received	: 13
Order number	: DEF19009/330	No. of samples analysed	: 13

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0958_MW141_210128, 0958_QC102_210128, 0958_MW403_210128, 0958_MW142_210128, 0958_MW401_210128, 0958_POT103_210128, 0958_POT102_210128, 0958_POT104_210128, 0958_POT101_210128, 0958_POT105_210128, 0958_QC101_210128	----	----	----	29-Jan-2021	28-Jan-2021	1

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	13	7.69	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	13	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)	28-Jan-2021	----	----	----	29-Jan-2021	28-Jan-2021	✖
0958_MW141_210128, 0958_QC102_210128,							
0958_MW403_210128, 0958_MW142_210128,							
0958_MW401_210128, 0958_POT103_210128,							
0958_POT102_210128, 0958_POT104_210128,							
0958_POT101_210128, 0958_POT105_210128,							
0958_QC101_210128							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128,	28-Jan-2021	----	----	----	01-Feb-2021 04-Feb-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128,	28-Jan-2021	----	----	----	01-Feb-2021 04-Feb-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128,	28-Jan-2021	----	----	----	29-Jan-2021 11-Feb-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128,	28-Jan-2021	----	----	----	01-Feb-2021 25-Feb-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128,	28-Jan-2021	----	----	----	01-Feb-2021 25-Feb-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128	28-Jan-2021	----	----	----	29-Jan-2021	04-Feb-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128	28-Jan-2021	----	----	----	03-Feb-2021	25-Feb-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128, 0958_QC401_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128, 0958_QC301_210128	28-Jan-2021	02-Feb-2021	27-Jul-2021	✓	03-Feb-2021	27-Jul-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0958_MW141_210128, 0958_MW403_210128, 0958_MW401_210128, 0958_POT102_210128, 0958_POT101_210128, 0958_QC101_210128, 0958_QC401_210128	0958_QC102_210128, 0958_MW142_210128, 0958_POT103_210128, 0958_POT104_210128, 0958_POT105_210128, 0958_QC301_210128	28-Jan-2021	02-Feb-2021	27-Jul-2021	✓	03-Feb-2021	27-Jul-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		28-Jan-2021	02-Feb-2021	27-Jul-2021	✔	03-Feb-2021	27-Jul-2021	✔
0958_MW141_210128,	0958_QC102_210128,							
0958_MW403_210128,	0958_MW142_210128,							
0958_MW401_210128,	0958_POT103_210128,							
0958_POT102_210128,	0958_POT104_210128,							
0958_POT101_210128,	0958_POT105_210128,							
0958_QC101_210128,	0958_QC301_210128,							
0958_QC401_210128								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		28-Jan-2021	02-Feb-2021	27-Jul-2021	✔	03-Feb-2021	27-Jul-2021	✔
0958_MW141_210128,	0958_QC102_210128,							
0958_MW403_210128,	0958_MW142_210128,							
0958_MW401_210128,	0958_POT103_210128,							
0958_POT102_210128,	0958_POT104_210128,							
0958_POT101_210128,	0958_POT105_210128,							
0958_QC101_210128,	0958_QC301_210128,							
0958_QC401_210128								
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		28-Jan-2021	02-Feb-2021	27-Jul-2021	✔	03-Feb-2021	27-Jul-2021	✔
0958_MW141_210128,	0958_QC102_210128,							
0958_MW403_210128,	0958_MW142_210128,							
0958_MW401_210128,	0958_POT103_210128,							
0958_POT102_210128,	0958_POT104_210128,							
0958_POT101_210128,	0958_POT105_210128,							
0958_QC101_210128,	0958_QC301_210128,							
0958_QC401_210128								



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	39	10.26	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	7.69	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	12.50	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	16	12.50	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	16	6.25	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	13	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



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

CS3009 R10 Modified by: Dr. R Symons Approved by: G. Jackson Approved on: 8 August 2019

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

Australia

Melbourne 6 Monterey Road Dandenong South VIC 3175 Phone : +61 3 8564 5000 NATA # 1261 Site # 1254 & 14271	Sydney Unit F3, Building F 16 Mars Road Lane Cove West NSW 2066 Phone : +61 2 9900 8400 NATA # 1261 Site # 18217	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Phone : +61 7 3902 4600 NATA # 1261 Site # 20794	Perth 2/91 Leach Highway Kewdale WA 6105 Phone : +61 8 9251 9600 NATA # 1261 Site # 23736	Newcastle 4/52 Industrial Drive Mayfield East NSW 2304 PO Box 60 Wickham 2293 Phone : +61 2 4968 8448	New Zealand Auckland 35 O'Rorke Road Penrose, Auckland 1061 Phone : +64 9 526 45 51 IANZ # 1327	Christchurch 43 Detroit Drive Rolleston, Christchurch 7675 Phone : 0800 856 450 IANZ # 1290
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Sample Receipt Advice

Company name: Cardno (WA)
Contact name: [REDACTED]
Project name: WA_0958_PFASOMP
Project ID: WA_0958_PFASOMP
Turnaround time: 5 Day
Date/Time received: Feb 1, 2021 11:14 AM
Eurofins reference: 770820

Sample Information

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

Notes

Contact

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

[REDACTED] on phone : [REDACTED] or by email: [REDACTED]

Results will be delivered electronically via email to [REDACTED] - [REDACTED]@cardno.com.au.

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

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

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

Project Name: WA_0958_PFASOMP
Project ID: WA_0958_PFASOMP

Order No.: DEF19009/330
Report #: 770820
Phone: [REDACTED]
Fax: [REDACTED]

Received: Feb 1, 2021 11:14 AM
Due: Feb 8, 2021
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105 °C	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoralkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180 °C ± 2 °C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217													
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
Mayfield Laboratory													
External Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	0958_QC201_210128	Jan 28, 2020		Water	P21-Fe01398	X	X	X	X	X	X	X	X
2	0958_QC202_210128	Jan 28, 2020		Water	P21-Fe01399	X	X	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2	2	2

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 23736

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

Attention:

Report **770820-W**
Project name **WA_0958_PFSOMP**
Project ID **WA_0958_PFSOMP**
Received Date **Feb 01, 2021**

Client Sample ID			0958_QC201_2 10128	0958_QC202_2 10128
Sample Matrix			Water	Water
Eurofins Sample No.			P21-Fe01398	P21-Fe01399
Date Sampled			Jan 28, 2020	Jan 28, 2020
Test/Reference	LOR	Unit		
Chloride	1	mg/L	63	77
Dissolved Organic Carbon	5	mg/L	< 5	42
pH (at 25 °C)	0.1	pH Units	6.5	3.7
Sulphate (as SO ₄)	5	mg/L	8.6	45
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	98	180
Total Organic Carbon	5	mg/L	6.2	43
Total Suspended Solids Dried at 103–105°C	1	mg/L	56	13
Alkalinity (speciated)				
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Carbonate Alkalinity (as CaCO ₃)	10	mg/L	< 10	< 10
Hydroxide Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Total Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Eurofins Suite B11C: Na/K/Ca/Mg				
Calcium	0.5	mg/L	< 5	< 5
Magnesium	0.5	mg/L	< 5	8.3
Potassium	0.5	mg/L	< 5	< 5
Sodium	0.5	mg/L	24	34
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.04
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.14
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.02
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.04
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTeDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	133	131
13C5-PFPeA (surr.)	1	%	103	104
13C5-PFHxA (surr.)	1	%	119	113
13C4-PFHpA (surr.)	1	%	134	138
13C8-PFOA (surr.)	1	%	140	141
13C5-PFNA (surr.)	1	%	126	136

Client Sample ID			0958_QC201_2 10128	0958_QC202_2 10128
Sample Matrix			Water	Water
Eurofins Sample No.			P21-Fe01398	P21-Fe01399
Date Sampled			Jan 28, 2020	Jan 28, 2020
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
13C6-PFDA (surr.)	1	%	127	116
13C2-PFUnDA (surr.)	1	%	106	92
13C2-PFDoDA (surr.)	1	%	85	68
13C2-PFTeDA (surr.)	1	%	36	49
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	121	98
D3-N-MeFOSA (surr.)	1	%	98	61
D5-N-EtFOSA (surr.)	1	%	89	57
D7-N-MeFOSE (surr.)	1	%	99	61
D9-N-EtFOSE (surr.)	1	%	97	72
D5-N-EtFOSAA (surr.)	1	%	71	92
D3-N-MeFOSAA (surr.)	1	%	110	81
Perfluoroalkyl sulfonic acids (PFSA's)				
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	< 0.01	0.06
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01	0.02
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	< 0.01	^{N09} 0.08
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.61
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	< 0.01	^{N09} 0.05
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.31
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	115	117
18O2-PFHxS (surr.)	1	%	137	137
13C8-PFOS (surr.)	1	%	110	105
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	145	137
13C2-6:2 FTSA (surr.)	1	%	47	47
13C2-8:2 FTSA (surr.)	1	%	153	154
13C2-10:2 FTSA (surr.)	1	%	91	89

Client Sample ID			0958_QC201_2 10128	0958_QC202_2 10128
Sample Matrix			Water	Water
Eurofins Sample No.			P21-Fe01398	P21-Fe01399
Date Sampled			Jan 28, 2020	Jan 28, 2020
Test/Reference	LOR	Unit		
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	0.92
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	0.35
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	0.96
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	1.22
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	1.37

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO₄/Alkalinity			
Chloride	Melbourne	Feb 03, 2021	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO ₄)	Melbourne	Feb 03, 2021	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Feb 03, 2021	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Dissolved Organic Carbon	Melbourne	Feb 03, 2021	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Melbourne	Feb 03, 2021	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Organic Carbon	Melbourne	Feb 03, 2021	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
Total Suspended Solids Dried at 103–105°C	Melbourne	Feb 03, 2021	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Feb 03, 2021	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Feb 03, 2021	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Feb 03, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Feb 03, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Feb 03, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Feb 03, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Feb 01, 2021	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
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2/91 Leach Highway
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Site # 23736

Newcastle
4/52 Industrial Drive
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PO Box 60 Wickham 2293
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Auckland
35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

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

Project Name: WA_0958_PFSOMP
Project ID: WA_0958_PFSOMP

Order No.: DEF19009/330
Report #: 770820
Phone: [REDACTED]
Fax: [REDACTED]

Received: Feb 1, 2021 11:14 AM
Due: Feb 8, 2021
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoralkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217													
Brisbane Laboratory - NATA Site # 20794													
Perth Laboratory - NATA Site # 23736													
Mayfield Laboratory													
External Laboratory													
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID								
1	0958_QC201_210128	Jan 28, 2020		Water	P21-Fe01398	X	X	X	X	X	X	X	X
2	0958_QC202_210128	Jan 28, 2020		Water	P21-Fe01399	X	X	X	X	X	X	X	X
Test Counts						2	2	2	2	2	2	2	2

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Organic Carbon	mg/L	< 5			5	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	113			70-130	Pass	
Sulphate (as SO ₄)	%	117			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	100			70-130	Pass	
Total Organic Carbon	%	102			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	109			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO ₃)	%	109			70-130	Pass	
Total Alkalinity (as CaCO ₃)	%	112			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	111			80-120	Pass	
Magnesium	%	97			80-120	Pass	
Potassium	%	98			80-120	Pass	
Sodium	%	92			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	100			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	100			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	100			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	101			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	105			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	97			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	103			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	86			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	96			50-150	Pass	
Perfluorotridecanoic acid (PFTeDA)	%	101			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	103			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	91			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	105			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	108			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	86			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	106			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	94			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	75			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	%	88			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	91			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	82			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	98			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	88			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	89			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	85			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	76			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	113			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	123			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	133			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	122			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Organic Carbon	S21-Fe05870	NCP	%	91			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	M21-Fe00744	NCP	%	76			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Bicarbonate Alkalinity (as CaCO ₃)	M21-Fe05740	NCP	%	112			70-130	Pass	
Carbonate Alkalinity (as CaCO ₃)	M21-Fe04275	NCP	%	117			70-130	Pass	
Total Alkalinity (as CaCO ₃)	M21-Fe05740	NCP	%	112			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	M21-Ja36387	NCP	%	103			75-125	Pass	
Magnesium	M21-Fe04715	NCP	%	94			75-125	Pass	
Potassium	M21-Fe04715	NCP	%	95			75-125	Pass	
Sodium	M21-Fe04715	NCP	%	97			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M21-Fe04337	NCP	%	102			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M21-Fe04337	NCP	%	100			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M21-Fe04337	NCP	%	102			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-Fe04337	NCP	%	105			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M21-Fe04337	NCP	%	102			50-150	Pass	
Perfluorononanoic acid (PFNA)	M21-Fe04337	NCP	%	95			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M21-Fe04337	NCP	%	96			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M21-Fe04337	NCP	%	103			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M21-Fe04337	NCP	%	110			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M21-Fe04337	NCP	%	155			50-150	Fail	Q08
Perfluorotetradecanoic acid (PFTeDA)	M21-Fe04337	NCP	%	102			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M21-Fe04337	NCP	%	108			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-Fe04337	NCP	%	106			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-Fe04337	NCP	%	94			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-Fe04337	NCP	%	94			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-Fe04337	NCP	%	109			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-Fe04337	NCP	%	95			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-Fe04337	NCP	%	50			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M21-Fe04337	NCP	%	91			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorononanesulfonic acid (PFNS)	M21-Fe04337	NCP	%	89			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M21-Fe04337	NCP	%	85			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M21-Fe04337	NCP	%	104			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M21-Fe04337	NCP	%	108			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M21-Fe04337	NCP	%	110			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M21-Fe04337	NCP	%	99			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M21-Fe04337	NCP	%	87			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-Fe04337	NCP	%	121			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-Fe04337	NCP	%	132			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-Fe04337	NCP	%	141			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-Fe04337	NCP	%	75			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M21-Fe02487	NCP	mg/L	1200	1200	<1	30%	Pass	
pH (at 25 °C)	P21-Fe04109	NCP	pH Units	4.8	4.8	pass	30%	Pass	
Sulphate (as SO ₄)	M21-Fe02487	NCP	mg/L	260	260	1.0	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	S21-Fe02041	NCP	mg/L	33000	35000	5.3	30%	Pass	
Total Organic Carbon	M21-Fe04715	NCP	mg/L	28000	33000	14	30%	Pass	
Total Suspended Solids Dried at 103–105°C	P21-Fe01398	CP	mg/L	56	62	12	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO ₃)	P21-Fe04109	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Carbonate Alkalinity (as CaCO ₃)	P21-Fe04109	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO ₃)	P21-Fe04109	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO ₃)	P21-Fe04109	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	M21-Ja36387	NCP	mg/L	10	8.8	16	30%	Pass	
Magnesium	M21-Fe04715	NCP	mg/L	760	750	1.0	30%	Pass	
Potassium	M21-Fe04715	NCP	mg/L	24	24	1.0	30%	Pass	
Sodium	M21-Fe04715	NCP	mg/L	2000	2000	1.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorodecanoic acid (PFDA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-Fe04336	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-Fe04336	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments**Sample Integrity**

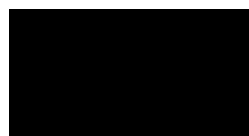
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Authorised By

	Senior Analyst-Metal (VIC)
	Senior Analyst-PFAS (VIC)
	Senior Analyst-Inorganic (VIC)

**General Manager**

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

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APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES



Table 3 - Field parameters

Gingin Satellite Airfield
PFAS OMP 2021 Q1 quarterly monitoring event

Monitoring Date	Site_ID	Sample_ID	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)	Other Observations on Bore/Site	Purge Method	Temp (Co)	DO (mg/L)	EC (us/Cm)	pH	Eh (mV)	QC Sample #	Odour	Colour
28/01/2021	MW401	0958_MW401_210128				Sampled from tap	Tap	25.1	2.9	256.6	6.32	-12	101/201	no	Cloudy
28/01/2021	MW402	-				Access to bore denied by Broadspectrum due to presence of Amoebae in water									
28/01/2021	POT101	0958_POT101_210128					Tap	25	5.08	514	6.44	142		no	Clear
28/01/2021	POT105	0958_POT105_210128					Tap	30.5	4.6	559	6.59	160.9		no	Clear
28/01/2021	POT104	0958_POT104_210128					Tap	24.5	5.34	614	6.66	227		no	Clear
28/01/2021	POT103	0958_POT103_210128					Tap	26.5	3.64	617	6.62	199.9		no	Clear
28/01/2021	POT102	0958_POT102_210128					Tap	24.4	5.65	557	7.17	193.9		no	Clear
28/01/2021	MW141	0958_MW141_210128	11.15	74.36	63.21		HydroSleeve	21.5	2.61	147.6	5.53	245.6	QC102/202	no	Yellow
28/01/2021	MW142	0958_MW142_210128	13.82	76.338	62.518		HydroSleeve	20.7	2.2	274.7	3.91	302.1		no	Yellow
28/01/2021	MW143	-				Bore dry									
28/01/2021	MW403	0958_MW403_210128	21.16	73.84	52.68		HydroSleeve	20.6	2	373.8	5.13	225.7		no	Cloudy, Clear



Calibration Report

Multi-Parameter Water Quality Instrument

Customer: [REDACTED]

Contact: [REDACTED]

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 20D101953

Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range	0 mV ± 50 mV	✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	174.00 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV -3 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Parameter	Standards	Reference	Calibration Point	Span	Units	Instrument Readings		
						Before	After	Units
Temperature		Room Temp	24.6	0	°C	NA	24.6	°C
pH	pH 7.00	356684	7.01	-21.80	mV	7.05	7.01	pH
pH	pH 4.00	355385	4.00	152.20	mV	4.05	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.08	2720	2764	µs/cm
ORP (Reference check only)	Zobell A & B	335411/335412	230	230	mV	232.8	232.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	0.1	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	6.25	uA	101.9	100.0	%

Calibrated by: [REDACTED]

Calibration Date: 26-Jan-21

Next Due: 25-Jul-21

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review

PFAS Ongoing Monitoring Plan Annual Interpretive Report – Q1 2021 Quarterly Monitoring

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
QA Documentation	
Project Quality Plan/Work Plan and Data Quality Objectives	<p>The field investigation was carried out on 28 January 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (ref DEF19009_Report03.1_Gingin Satellite Airfield_ OMP PFAS_SAQP) issued to the client and in general compliance with Standards Australia 1998. AS/NZ 5667:1998 <i>Water quality – sampling</i> and NEPM “National Environment Protection (Assessment of Site Contamination) Measure”.</p> <p>A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (PFAS OMP Q12021 Factual Report). In addition, a safety, health and environment work method statement (SHEWMS) was also prepared.</p> <p>The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.</p>
Data Representativeness	
Use of Composites	No Composites were used during the investigation
Holding Times	<p>Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes. with the exception of the following:</p> <ul style="list-style-type: none"> ▪ EP2100912 <ul style="list-style-type: none"> - pH – one days overdue (All samples) <p>The holding time exceedances for pH are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.</p>
Background samples	No background samples were collected during the course of the investigation.
Verification of field procedures	<p>The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP.</p> <p>None disposable equipment was decontaminated between sample locations.</p>

QA/QC Aspects	Evidence & Evaluation															
Data Precision & Accuracy																
QC sample Frequency	<table><tr><th>QC sample type</th><th>SAQP required frequency</th><th>Sample Collected</th></tr><tr><td>Blind duplicate</td><td>1 in 10 primary samples (10%)</td><td>1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)</td></tr><tr><td>Split duplicate</td><td>1 in 10 primary samples (10%)</td><td>1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)</td></tr><tr><td>Rinsate</td><td>1 per YSI per day</td><td>1 for 1 day (100%)</td></tr><tr><td>Field Blank</td><td>1 per day</td><td>1 for 1 day (100%)</td></tr></table>	QC sample type	SAQP required frequency	Sample Collected	Blind duplicate	1 in 10 primary samples (10%)	1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)	Split duplicate	1 in 10 primary samples (10%)	1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)	Rinsate	1 per YSI per day	1 for 1 day (100%)	Field Blank	1 per day	1 for 1 day (100%)
	QC sample type	SAQP required frequency	Sample Collected													
	Blind duplicate	1 in 10 primary samples (10%)	1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)													
	Split duplicate	1 in 10 primary samples (10%)	1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)													
	Rinsate	1 per YSI per day	1 for 1 day (100%)													
Field Blank	1 per day	1 for 1 day (100%)														
QC Testing – Blind Replicates (Primary Lab)	<ul style="list-style-type: none">RPD Acceptance Criteria: <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <p>Groundwater</p> <ul style="list-style-type: none">Primary Groundwater Samples Analysed: 3Blind Replicate Samples Analysed: QC102 <p>All RPDs were within acceptance criteria.</p> <p>Tap water</p> <ul style="list-style-type: none">Primary tap water Samples Analysed: 6Blind Replicate Samples Analysed: QC101 <p>All RPDs were within acceptance criteria.</p>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
QC Testing – Field Splits (Secondary Lab)	<ul style="list-style-type: none">RPD Acceptance Criteria: <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <p>Groundwater</p> <ul style="list-style-type: none">Primary Groundwater Samples Analysed: 3Field Split Samples Analysed: QC202 <p>One exceedance of the acceptable RPD range was identified for PFOS. This is probably attributable to the difference of methodologies between the primary and secondary laboratories and is not considered to have affected the validity of the dataset.</p> <p>Tap water</p> <ul style="list-style-type: none">Primary tap water Samples Analysed: 6Field Split Samples Analysed: QC201 <p>All RPDs were within acceptance criteria.</p>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
Field Blanks	Field Blanks were collected at a rate of one per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.															
Laboratory Internal QC	<p>Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and satisfactory results for method blank, laboratory control samples and laboratory duplicates.</p> <p>There were no Matrix Spike outliers recorded.</p> <p>The following Quality Control sample frequency non-conformance was reported:</p> <ul style="list-style-type: none">EP2100912<ul style="list-style-type: none">Laboratory duplicate (PFAS): expected rate: 10%, actual: 7.69%.															

QA/QC Aspects	Evidence & Evaluation
	<ul style="list-style-type: none"> - Matrix Spike (PFAS): expected rate: 5%, actual: 0%. <p>No Method Blank value outliers were reported.</p>
Laboratory Method Detection Limit	Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.
NATA endorsement of laboratory reports	<p>Laboratory reports were stamped with the NATA endorsement stamp and signature.</p> <p>ALS Accreditation No. 825</p> <p>Eurofins Accreditation No. 1261</p>
Calibration of Field Equipment	<p>All equipment used during the investigation was calibrated by the supplier prior to use.</p> <p>The equipment calibration certificates are provided in Appendix D.</p>
Decontamination and Equipment Blanks	Rinsate blanks were collected at a rate of one per day when reusable equipment (water quality meter) was used. All rinsate samples tested reported analytes concentrations below the laboratory LORs.
Data Comparability	
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
Data Completeness	
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- ☐ A factual report of the condition of a portion of the site or one aspect of an entire site.
- ☐ Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- ☐ Validation of the success of remediation of a site or a portion of a site.
- ☐ Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide “environmental sign-off” of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants’ duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the “hot spot” method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

PFAS OMP Biannual Sampling Event Factual Report

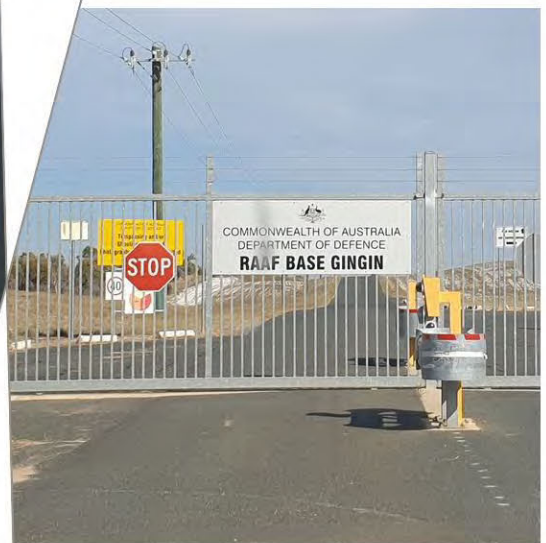
Post-Summer 2021

Gingin Satellite Airfield

DEF19009

Prepared for
Department of Defence

4 July 2022



Contact Information

Cardno (WA) Pty Ltd

ABN 77 009 119 000

11 Harvest Terrace
West Perth WA 6005
Australia

www.cardno.com

Phone +61 8 9273 3888

Fax +61 8 9486 8664

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Senior Environmental Engineer

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

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Chemical Names

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

Technical Terms

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

QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan
SEPP	State Environment Protection Policy

Units

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

Site Specific

OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) at Royal Australian Air force (RAAF) Gingin Satellite Airfield (“the site”). The site is located in Yeal, Western Australia and is displayed in Figure 1 of Appendix A.

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

- > Cardno, 30 March 2021, Reference: DEF19009, ‘PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Gingin Satellite Airfield’.

The SAQP was reviewed prior to the sampling event and no changes related to the bi-annual monitoring event were made.

For the purposes of this report:

- > Management Area was defined as Gingin Satellite Airfield (Figure 1, Appendix A).
- > Monitoring Area was defined as comprising the Site, plus the parcel of Crown Land that represents the Yeal Swamp Nature Reserve – an area that surrounds much of the southern, western and northern extent of the Base. The lateral extents of the Monitoring Area are aligned with the boundary of the adjoining Crown Lands property (Figure 1, Appendix A).

1.2 Purpose & Objectives

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

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

The objectives of the report are:

- > To provide a succinct summary of the Post-Summer 2021 sampling event and provision of analytical results with supporting tables and figures.
- > To provide confirmation of the current understanding of risk.
- > To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

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

- > National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).
- > Heads of Environmental Protection Authority’s Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.
- > Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.
- > Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

- > Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites¹.
- > Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

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

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in accordance with the SAQP (Cardno, 2021), applying methods set out in Section 3 of this report. The groundwater bores monitored as part of the OMP quarterly monitoring event are presented in Table 2-1, and are shown on Figure 2A and 2B, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
On-Site – Source Areas	Former fuel farm (SA01) - 0958_MW112S, 0958_MW113S, 0958_MW101I, 0958_MW102D, 0958_MW301, 0958_MW302, 0958_MW303.
	Fire house and Refuelling area (SA02) - 0958_MW504, 0958_MW104I, 0958_MW105D, 0958_MW304, 0958_MW305, 0958_MW306.
	Powerhouse (SA03) - 0958_MW307, 0958_MW308, 0958_MW309, 0958_MW310.
	Landfills - 0958_MW106S, 0958_MW107S, 0958_MW108S, 0958_MW109S, 0958_MW110S.
On-Site – secondary sources	Sewage system and leach field (SA04) : 0958_MW114S
	Site Drainage - 0958_MW115S
	Water Supply Infrastructure – 0958_MW505, 0958_MW312, 0958_MW313, 0958_MW111S
	Abstraction bore 1 - 0958_MW401
On-site - other	Abstraction bore 2 – 0958_MW402
	Airside perimeter – 0958_MW116S, 0958_MW117I, 0958_MW118D, 0958_MW119S, 0958_MW120I, 0958_MW121D, 0958_MW122S, 0958_MW123I, 0958_MW124D
	Site boundary – 0958_MW125S, 0958_MW126I, 0958_MW128S, 0958_MW129I, 0958_MW130D, 0958_MW131S, 0958_MW132I, 0958_MW133D, 0958_MW134D, 0958_MW135I, 0958_MW136D, 0958_MW138S, 0958_MW139I, 0958_MW140D
Off-Site	Background - 0958_MW137S
	Water Corporation Production bores ⁽¹⁾ : Pinjar Production P140, Pinjar Production P145
	Public land ⁽²⁾ : 0958_MW143S, 0958_MW142S, 0958_MW141S, 0958_MW403

Note: (1) These are currently being sampled by the Water Corporation and results provided to Defence for review.

(2) Yeal Swamp Nature Reserve managed by the Department of Parks and Wildlife (DPaW) / Vacant Crown Land managed by the Department of Planning, Lands and Heritage (DLPH)

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

2.2 Tap Water Monitoring

Water samples were collected from the tap water monitoring locations listed in Table 2-2 in accordance with the SAQP (Cardno, 2020) and sampling methodology detailed in section 3.2. The tap water monitoring locations are shown on Figure 2A and 2B, Appendix A.

Table 2-2 Tap Water Monitoring Locations

Monitoring Area	Location ID
On-Site	0958_POT101; 0958_POT102; 0958_POT103; 0958_POT104; 0958_POT105.

2.3 Data Management

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

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

2.3.1 Defence ESdat database

Data collected as part of the Post-Summer 2021 OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

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

2.4 Deviations from the OMP SAQP

Deviations from the SAQP for the Q2 2021 monitoring event are presented in Table 2-3 below.

Table 2-3 Deviations from the OMP SAQP

Location	Deviation	Comments
MW107S, MW108S, MW111S, MW114S, MW134D, MW143S, MW304, MW305, MW306, MW308, MW309	Not sampled	These wells were found dry
MW112S	Sample mis-labelled by the lab	Sample mis-labelled MW136 in lab documentation
MW110S	TOC analysed instead of DOC	Sample was not field filtered.
MW122S	DOC and TDS not analysed	Sample volume insufficient.
Pinjar Production P140, Pinjar Production P145	Not sampled	No data has been obtained for these two bores.

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken by no purge HydraSleeve® method as detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) was gauged in each well prior to sampling using an interface probe. All wells were measured against a specified mark at the top of the well casing.
Groundwater Field Parameters	<p>Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) were calibrated by the equipment supplier and bump tested on the field daily to optimise the accuracy of the measurements taken. Calibration certificates and bump test records are provided in Appendix D.</p>
Deployment of HydraSleeve	HydraSleeve were deployed with top weight sample collection to begin at the lowest point.
Retrieval of HydraSleeves (Sample Collection)	<p>HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment. Samples were collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples were discharged immediately (minimise changes in chemistry) via discharge tube.</p> <p>Following sampling, hydrasleeves were deployed in preparation for the next OMP monitoring event using the same string for consistency between event (same depth of sampling i.e. within screen).</p>
Decontamination procedure	<p>Dedicated HydraSleeves were used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p>
Laboratory Testing	<p>Groundwater samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. <p>The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix C.</p>

3.2 Tap water Sampling Methodology

Water samples from abstraction bores and taps were collected via the 'first flush' sampling method. The primary objective of the 'first flush' sampling method is to collect water representative of the user, who may not purge the water line.

Field parameters (pH, temperature, EC, ORP and DO) were recorded post sampling collection via flow cell, samples were analysed for the same analytical suite as the groundwater monitoring wells, the analytical suite is detailed in Table 3-1.

3.3 Quality Control / Quality Assurance

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

- > QA documentation.
- > Bias.
- > Data Representativeness.
- > Data Precision & Accuracy.
- > Laboratory Performance.
- > Data Comparability.
- > Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E. The data quality review indicates no significant systematic errors in the data collection process for groundwater and tap water and therefore, the data set used as the basis for this assessment is considered valid and complete.

3.4 Assessment Criteria

3.4.1 Groundwater and Tap water

The adopted assessment criteria for groundwater and tap water are detailed in Table 3-2.

Table 3-2 Criteria for Groundwater and Tap water

Exposure Scenario	Adopted Assessment Criteria		
	PFHxS / PFOS µg/L	PFOA	Guidance
Human Health - Drinking Water Quality Guideline	0.07	0.56	HEPA 2020
Human Health – Recreational Use Guideline	2.0	10	HEPA 2020

4 Field Observations and Results

4.1 General Site Observations

No weather event or Site activities that could have impacted the sampling event or results obtained were noted during the Post-Summer monitoring event.

4.2 Groundwater

4.2.1 Summary of Field Observations

4.2.1.1 Physicochemical parameters

Stabilised physicochemical parameters, water colour and turbidity observations recorded during the groundwater and tap water sampling event are presented in field sampling records, included in Appendix D. Parameters were generally consistent with the previous monitoring event. Groundwater pH was slightly acidic, water colour was generally clear and in some instances brown, and slightly saline. DO readings indicate aerobic groundwater conditions. It is noted that a sulphur smell was reported at MW141S and MW123I as well as a slight odour reported at MW130D and MW402.

4.2.1.2 Groundwater gauging

Groundwater depth ranged from 56.62 mAHD (MW135I) to 65.556 mAHD (MW310) which is consistent with historical data. Gauging records are presented in Appendix D. Inferred groundwater contours and flow direction are presented on Figures 3 and 4, Appendix A.

4.2.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data in order to identify monitoring locations where a first detect of PFOA or PFOS+PFHxS or a new exceedance of a guideline value were reported. Figure 2 in Appendix A presents the groundwater monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	MW301, MW303	0.56 ²	1.32 (MW301)	47	2
Sum of PFHxS and PFOS	MW101I, MW102D, MW504, MW104I, MW105D, MW109S, MW110S, MW112S, MW123I, MW138S, MW141S, MW301, MW302, MW303, MW307, MW310, MW505, MW312, MW313, MW402,	0.07 ²	82.8 (MW303)	47	20

Notes:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > MW105D (fire house and refuelling area) reported a new exceedance (2.46 µg/L) of the recreational use guideline (2 µg/L) for Sum of PFHxS and PFOS.
- > MW505 (former fuel farm) reported a first time detect for PFOA (0.03 µg/L). However, it is noted that MW505 was installed to replace MW311 which has previously had detects.

4.3 Tap water

4.3.1 Summary of Field Observations

Stabilised physiochemical parameters and observations recorded during the tap water sampling event are presented in field sampling records, included in Appendix D. Parameters were generally consistent with the previous monitoring event. Tap water pH was near neutral, water was mostly clear and slightly saline. DO readings indicate aerobic tap water conditions. No visual or olfactory evidence of contamination were recorded.

4.3.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data in order to identify monitoring locations where a first detect of PFOA or PFOS+PFHxS or a new exceedance of a guideline value were reported. Figure 2 in Appendix A presents the tap water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Tap Water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	0.56 ²	0.03	5	0
Sum of PFHxS and PFOS	POT101, POT102, POT103, POT104, POT105	0.07 ²	0.80 (POT104)	5	5

Note:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > No first time detect of PFOA or Sum of PFOS and PFHxS were reported for the tap water locations.
- > All five tap water samples reported Sum of PFOS and PFHxS concentrations above the drinking water guideline value but below the recreational use value, which is similar to previous monitoring events.
- > All samples reported a detectable concentration of PFOA (i.e. above laboratory LOR) but below the adopted assessment criteria.

4.4 Changes to the Monitoring Network Condition

No changes to the monitoring network condition that could have impacted the data integrity was recorded during the Post-Summer 2021 monitoring event.

Abstraction bore 2 (MW402) which was tagged off during the January 2021 quarterly monitoring event, was cleared and able to be sampled.

The Department of Defence has been advised that the Water Corporation will continue to sample for PFAS at production bores Pinjar bore 140 (Superficial aquifer) and Pinjar bore 145 (Leederville aquifer) on a quarterly basis.

5 Summary and Conclusions

Cardno undertook the Post-Summer 2021 groundwater and tap water monitoring event at Gingin Satellite Airfield as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 47 monitoring wells on- and off-Site, two abstraction bores and five tap water locations. Eleven (11) groundwater monitoring wells couldn't be sampled as these wells were found to be dry.

The groundwater laboratory results reported the following:

- > Of the 47 groundwater samples tested, Sum of PFOS and PFHxS (20 samples) and PFOA (2 samples) reported exceedances of the adopted assessment criteria.
- > MW105D (fire house and refuelling area) reported a new exceedance (2.46 µg/L) of the recreational use guideline (2 µg/L) for Sum of PFHxS and PFOS.
- > No groundwater sampling locations reported a first detect or new exceedance of guideline values for PFOA.
- > MW505 (former fuel farm) reported a first time detect for PFOA (0.03 µg/L). However, it is noted that MW505 was installed to replace MW311 which has previously had detects.
- > Groundwater results were generally consistent with the previous monitoring events.

The tap water laboratory results reported the following:

- > All five (5) samples tested reported Sum of PFOS and PFHxS concentrations above the drinking water criteria but below the recreational use criteria, which is similar to the previous monitoring events.
- > All five (5) samples reported PFOA concentrations above the laboratory LOR but below the adopted assessment criteria.
- > No first time detect or new exceedance of guideline values were reported for the tap water monitoring locations.

PFAS concentrations at the groundwater and tap water locations sampled during the Post-Summer 2021 monitoring event were generally of the same order of magnitude as historical events.

The next OMP sampling event for Gingin Satellite Airfield is the quarterly monitoring event (Q3 2021), scheduled for July 2021.

6 References

General References

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6. Department of Environment Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*.
7. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (<https://maps.water.wa.gov.au/#/webmap/gwm>).
8. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, 'Guidance on Environmental Data Verification and Data Validation'.
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10. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
11. National Health and Medical Research Council (NHMRC) (2011 – updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
12. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
13. Standards Australia/Standards New Zealand (1998) AS5667.1:1998 'Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'.
14. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
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16. Department of Environment and Energy, 2017, Defence Contamination Management Manual (DCMM) Annex L, 'OMP Factual Report Writing Guidance'.

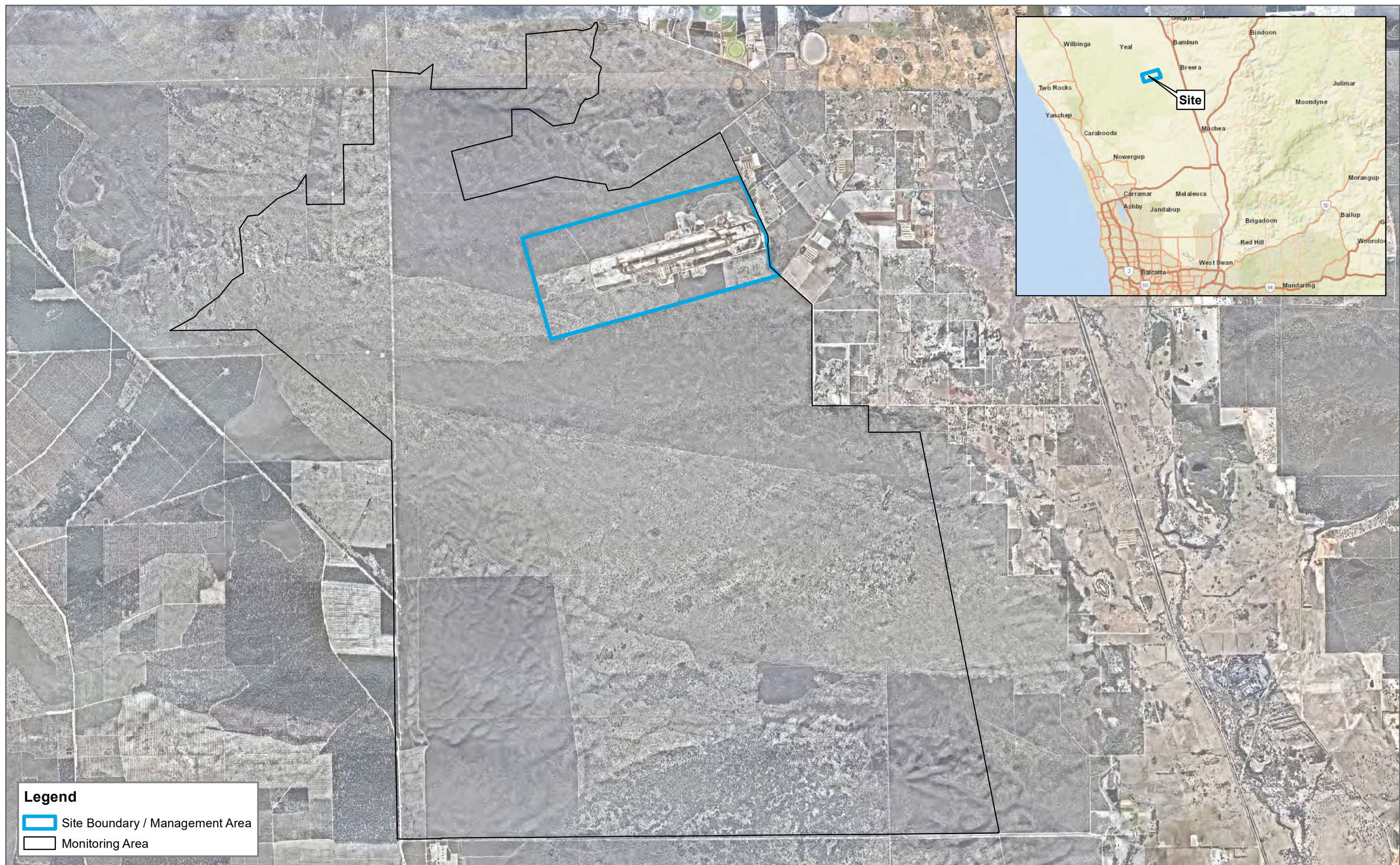
Site Specific References

17. Cardno, 2019, PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan.
18. Cardno, April 2020, PFAS OMP, Biannual Monitoring Factual Report – post-summer 2020.
19. Cardno, December 2020, PFAS OMP, Biannual Monitoring Factual Report - August 2020.
20. Cardno, December 2020, PFAS OMP, Biannual Monitoring Factual Report – post-winter 2020.
21. Department of Defence, 2018a, Gingin Satellite Airfield PFAS Ongoing Monitoring Plan.
22. Department of Defence, 2018b, Gingin Satellite Airfield PFAS Investigation, PFAS Management Area Plan
23. Jacobs, 2018a, Preliminary Conceptual Site Model - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0001).
24. Jacobs, 2018b, Sampling, Analysis and Quality Plan - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0002).
25. Jacobs, 2018c, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-003).
26. Jacobs, 2018d, Tier 2 Human Health Risk Assessment – Offsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0005).
27. Jacobs, 2018e, Tier 3 Human Health Risk Assessment – Onsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0006).
28. Jacobs, 2019, PFAS Ongoing Groundwater Monitoring Report (No. IS219200-0000-NP-RPT-0008).

APPENDIX

A

FIGURES



Legend

 Site Boundary / Management Area

 Monitoring Area

FIGURE 1
1:60,000 Scale at A3

Meters

0 1,000 2,000

Site Location

**BIANNUAL SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE**



Map Produced by Cardno WA
Date: 2021-08-05 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Nearmap

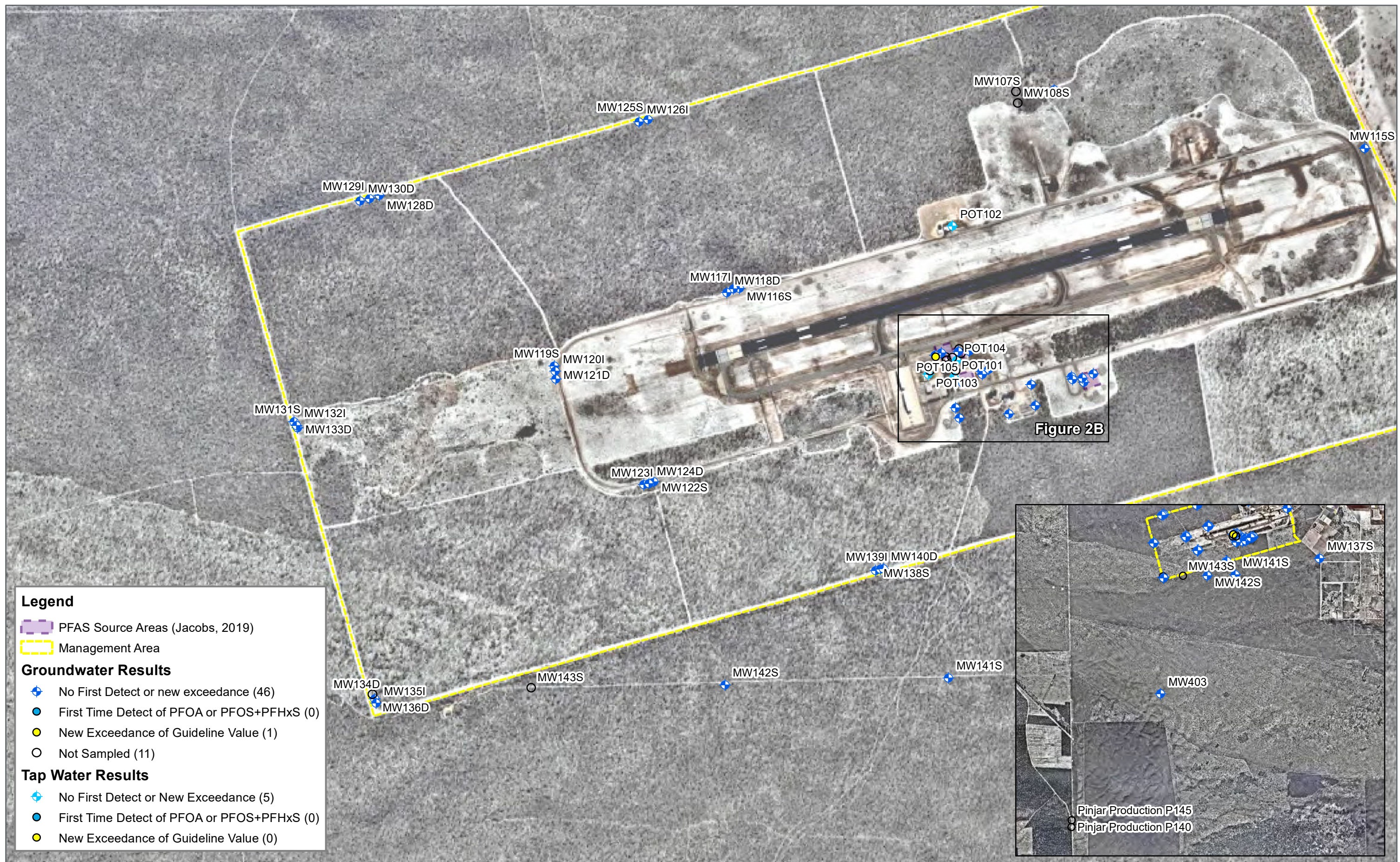


FIGURE 2A
1:12,500 Scale at A3

Meters
0 200 400

Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2022-05-31 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-002A_2021Q2PFASResults 01.mxd
Aerial Imagery Supplied by Nearmap



FIGURE 2B
1:1,750 Scale at A3

Meters
0 50 100

Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-08-05 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-003B_2021Q2PFASResults 02.mxd
Aerial Imagery Supplied by Nearmap

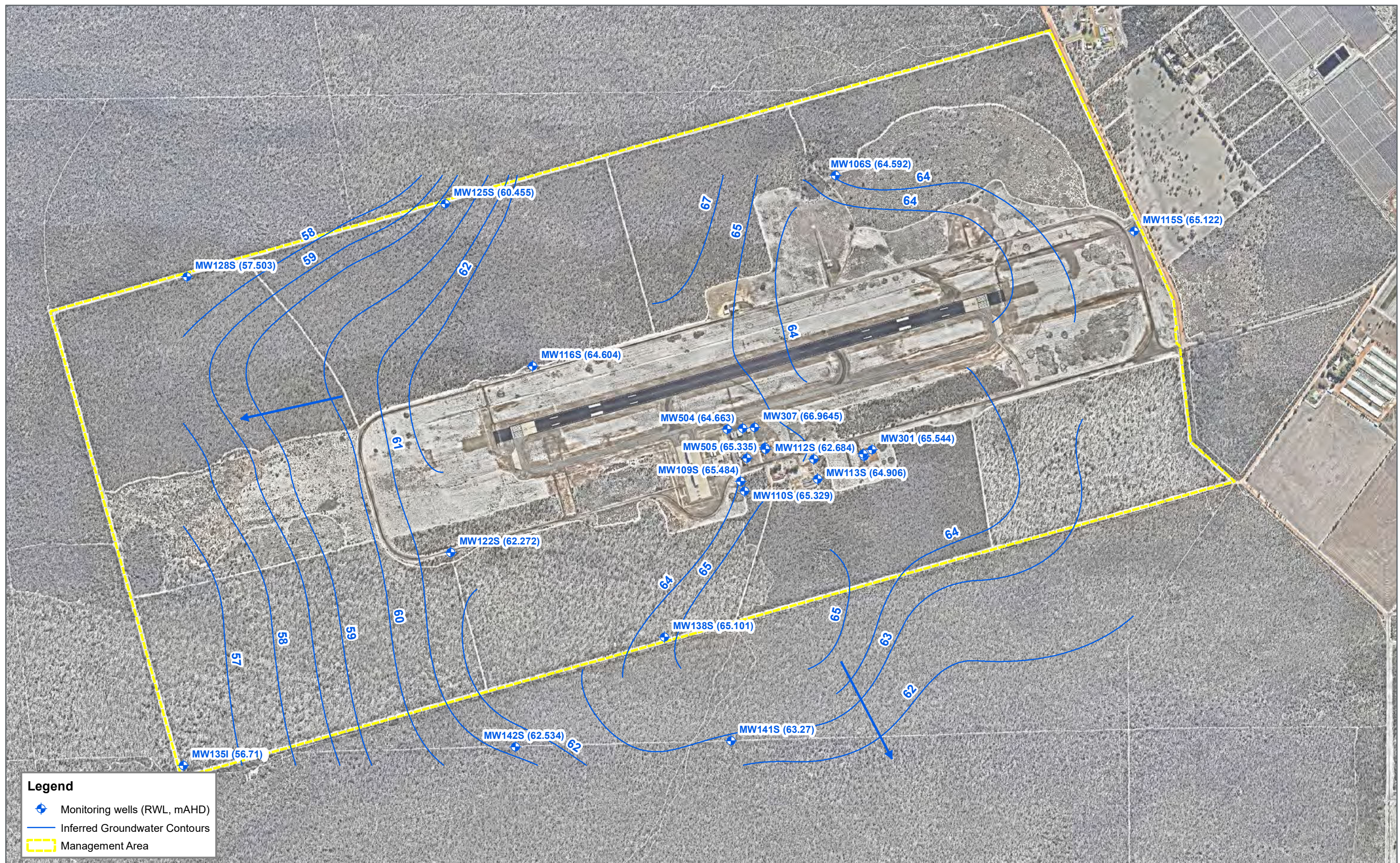




FIGURE 4
1:12,500 Scale at A3

Meters
0 200 400

Inferred Groundwater Contours (Deep Aquifer)

BIANNUAL SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-08-05 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-004_2021Q2DeepGWContours 01.mxd
Aerial Imagery Supplied by Nearmap

APPENDIX

B

DATA ASSESSMENT TABLES



Table 1 - Groundwater and Tap water Analytical Results

Post Summer 2021 OMP monitoring event
Gingin Satellite Airlfield

					PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids								PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides									
					Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Σ2 Fluorotelomer sulfonic acid (Σ2 FTS)	Σ2 Fluorotelomer sulfonic acid (Σ2 FTS)	Σ2 Fluorotelomer sulfonic acid (Σ2 FTS)	Σ2 Fluorotelomer sulfonic acid (Σ2 FTS)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-methyl perfluorooctane sulfonamide (MeFOSA)	N-methyl perfluorooctane sulfonamide (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSE)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
[LOR - Limit of Reporting					0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05
HEPA (2020) Human Health - Drinking Water Quality					0.56																											
HEPA (2020) Recreational Use					10																											
Monitoring Area	Location Code	Field ID	Date	Lab Report	<0.04	<0.04	0.16	<0.04	0.09	<0.04	<0.2	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.10	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.04	<0.10	<0.04	<0.10	<0.10	<0.04	<0.10	
Former Fuel Farm	MW101I	0958_MW101I_210428	28/04/2021	EP2104666	0.13	<0.02	0.20	0.03	0.28	<0.02	<0.1	0.02	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Former Fuel Farm	MW102D	0958_MW102D_210428	28/04/2021	EP2104666	0.04	0.03	0.26	<0.02	0.13	<0.02	<0.1	0.05	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Fire House and Refueling Area	MW104I	0958_MW104I_210428	28/04/2021	EP2104665	0.07	0.13	1.33	0.07	1.13	<0.02	<0.1	0.19	0.03	0.03	0.08	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Fire House and Refueling Area	MW105D	0958_MW105D_210428	28/04/2021	EP2104665	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Primary Landfill	MW106S	0958_MW106S_210427	27/04/2021	EP2104577	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Secondary Landfill	MW109S	0958_MW109S_210428	28/04/2021	EP2104666	<0.02	<0.02	0.07	<0.02	0.42	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Secondary Landfill	MW110S	0958_MW110S_210428	28/04/2021	EP2104666	<0.02	<0.02	0.02	<0.02	0.07	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Fire Equipment Testing - Former Fuel Farm	MW113S	0958_MW113S_210428	28/04/2021	EP2104666	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Drainage - East of Runway	MW115S	0958_MW115S_210428	28/04/2021	EP2104666	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW116S	0958_MW116S_210428	28/04/2021	EP2104679	<0.02	<0.02	0.04	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW117I	0958_MW117I_210428	28/04/2021	EP2104679	<0.02	<0.02	0.03	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW118D	0958_MW118D_210428	28/04/2021	EP2104679	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW119S	0958_MW119S_210428	28/04/2021	EP2104679	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW120I	0958_MW120I_210428	28/04/2021	EP2104679	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW121D	0958_MW121D_210428	28/04/2021	EP2104679	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW122S	0958_MW122S_210428	28/04/2021	EP2104679	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW123I	0958_MW123I_210428	28/04/2021	EP2104679	<0.02	<0.02	0.08	<0.02	0.05	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Inner Perimeter	MW124D	0958_MW124D_210428	28/04/2021	EP2104679	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW125S	0958_MW125S_210427	27/04/2021	EP2104577	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW126I	0958_MW126I_210427	27/04/2021	EP2104577	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW128D	0958_MW128S_210427	27/04/2021	EP2104577	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW129I	0958_MW129I_210427	27/04/2021	EP2104577	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW130D	0958_MW130D_210427	27/04/2021	EP2104577	0.04	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW131D	0958_MW131D_210427	27/04/2021	EP2104577	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW132I	0958_MW132I_210427	27/04/2021	EP2104577	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	
Site Boundary	MW133D	0958_MW133D_210427																														

First time detect of PFOA or PFOS+PFHxS
New Exceedance of guideline value



Table 2: Rinsate Blank Analytical Results

				PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomer Sulfonic Acids				
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTrDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting				0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05	0.05	0.05
Field ID	Date	Sample Type	Lab Report Number																					
0958_QC301_210427	27/04/2021	Rinsate	EP2104578	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC301_210428	28/04/2021	Rinsate	EP2104665	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC301_210505	5/05/2021	Rinsate	EP2104964	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC302_210427	27/04/2021	Rinsate	EP2104578	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC302_210428	28/04/2021	Rinsate	EP2104665	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC303_210428	28/04/2021	Rinsate	EP2104665	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC401_210427	27/04/2021	Field Blank	EP2104578	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC401_210428	28/04/2021	Field Blank	EP2104665	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC401_210505	5/05/2021	Field Blank	EP2104964	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC402_210427	27/04/2021	Field Blank	EP2104578	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC402_210428	28/04/2021	Field Blank	EP2104665	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0958_QC403_210428	28/04/2021	Field Blank	EP2104665	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
Statistics																								
Number of Results				12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Number of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration				<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
Minimum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration				<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
Maximum Detect				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *				0.01	0.01	0.01	0.01	0.005	0.01	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.025	0.01	0.01	0.025	0.025	0.025	0.025
Geometric Average *				0.01	0.01	0.01	0.01	0.005	0.01	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.025	0.01	0.01	0.025	0.025	0.025	0.025
Median Concentration *				0.01	0.01	0.01	0.01	0.005	0.01	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.025	0.01	0.01	0.025	0.025	0.025	0.025
Standard Deviation *				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *				0.01	0.01	0.01	0.01	0.005	0.01	0.05	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.025	0.01	0.01	0.025	0.025	0.025	0.025
% of Detects				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects				100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.



Table 2: Rinsate Blank Analytical Results

	PFA		PFAS - Perfluoroalkyl Sulfonamides								PFAS		
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)		Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.02	0.02	0.02	0.05	0.02	0.05	0.05	0.02	0.05		0.01	0.01	0.01

Field ID	Date	Sample Type	Lab Report Number												
0958_QC301_210427	27/04/2021	Rinsate	EP2104578	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC301_210428	28/04/2021	Rinsate	EP2104665	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC301_210505	5/05/2021	Rinsate	EP2104964	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC302_210427	27/04/2021	Rinsate	EP2104578	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC302_210428	28/04/2021	Rinsate	EP2104665	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC303_210428	28/04/2021	Rinsate	EP2104665	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC401_210427	27/04/2021	Field Blank	EP2104578	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC401_210428	28/04/2021	Field Blank	EP2104665	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC401_210505	5/05/2021	Field Blank	EP2104964	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC402_210427	27/04/2021	Field Blank	EP2104578	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC402_210428	28/04/2021	Field Blank	EP2104665	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC403_210428	28/04/2021	Field Blank	EP2104665	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Statistics														
Number of Results	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.005	0.005	0.005	0.005	0.005
Geometric Average *	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.005	0.005	0.005	0.005	0.005
Median Concentration *	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.005	0.005	0.005	0.005	0.005
Standard Deviation *	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geometric Standard Deviation *	1	1	1	1	1	1	1	1	1	1	1	1	1	1
95% UCL (Student's-t) *	0.01	0.01	0.01	0.025	0.01	0.025	0.025	0.01	0.025	0.005	0.005	0.005	0.005	0.005
% of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% of Non-Detects	100	100	100	100	100	100	100	100	100	100	100	100	100	100

* A Non Detect Multiplier of 0.5 has been applied.

Field ID		0958_MW138S_210427	0958_QC102_210427		0958_MW138S_210427	0958_QC202_210427		0958_MW402_210427	0958_QC101_210427		0958_MW402_210427	0958_QC201_210427	
Date		27/04/2021	27/04/2021		27/04/2021	27/04/2021		27/04/2021	27/04/2021		27/04/2021	27/04/2021	
Matrix Type		Water	Water		Water	Water		Water	Water		Water	Water	
Lab Report Number		EP2104577	EP2104577	RPD	EP2104577	791818	RPD	EP2104578	EP2104578	RPD	EP2104578	791818	RPD
	Unit	LOR - Limit of Reporting											
PFAS - Perfluoroalkyl Sulfonic Acids													
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01				<0.01						0.02	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.01	0	0.06	0.06	0	0.06	0.06	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.01	0	0.07	0.07	0	0.07	0.06	15
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.09	0.08	12	0.09	0.07	25	0.54	0.54	0	0.54	16
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.04	0.04	0	0.04	67
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.14	0.13	7	0.14	0.19	30	0.26	0.27	4	0.26	32
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01				<0.01						<0.01	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0
PFAS - Perfluoroalkyl Carboxylic Acids													
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	0.01	0	0.11	0.12	9	0.11	20
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	40
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	0.02	0.03	40	0.02	40
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0
PFAS - Fluorotelomer Sulfonic Acids													
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	0
PFAS - Perfluoroalkyl Sulfonamides													
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	0
PFAS													
Sum of PFAS (WA DER List)	µg/L	0.01	0.23	0.21	9	0.23	0.27	16	0.99	1.02	3	0.99	5
Sum of PFHxS and PFOS	µg/L	0.01	0.23	0.21	9	0.23	0.26	12	0.80	0.81	1	0.80	2
Sum of PFAS	µg/L	0.01	0.23	0.21	9	0.23	0.27	16	1.10	1.13	3	1.10	4
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01				0.26						0.85	
Metals													
Calcium	mg/L	0.5				3.0						0.9	
Calcium (filtered)	mg/L	0.5	3	4	29	3			1	1	0	1	
Magnesium	mg/L	0.5				7.2						3.4	
Magnesium (filtered)	mg/L	0.5	7	7	0	7			4	4	0	4	
Potassium	mg/L	0.5				2.2						1.2	
Potassium (filtered)	mg/L	0.5	3	3	0	3			2	2	0	2	
Organic													
Dissolved Organic Carbon	mg/L	1	73	75	3	73			6	6	0	6	
Dissolved Organic Carbon (filtered)	mg/L	1				43						16	

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

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

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

Field ID		0958_MW129I_210427	0958_QC103_210427		0958_MW129I_210427	0958_QC203_210427		0958_MW102D_210428	0958_QC104_210428		0958_MW102D_210428	0958_QC204_210428		0958_MW104I_210428	0958_QC105_210428		
Date		27/04/2021	27/04/2021		27/04/2021	27/04/2021		28/04/2021	28/04/2021		28/04/2021	28/04/2021		28/04/2021	28/04/2021		
Matrix Type		Water	Water		Water	Water		Water	Water		Water	Water		Water	Water		
Lab Report Number		EP2104577	EP2104577	RPD	EP2104577	791818	RPD	EP2104666	EP2104666	RPD	EP2104666	791819	RPD	EP2104665	EP2104665	RPD	
	Unit	LOR - Limit of Reporting															
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01				<0.01						<0.01					
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.13	0.14	7	0.13	0.01	171	0.04	0.04	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0.02	0	0.03	0.03	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.20	0.23	14	0.20	0.20	0	0.26	0.25	4
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.03	0.04	29	0.03	0.02	40	<0.02	<0.02	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	0.28	0.31	10	0.28	0.33	16	0.13	0.11	17
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01				<0.01						<0.01					
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	0.02	0.02	0	0.02	0.02	0	0.05	0.04	22
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	0.01	0	<0.02	<0.02	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	0.01	0.01	0	0.01	0.01	0	0.01	0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
PFAS - Perfluoroalkyl Sulfonamides																	
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS																	
Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.05	0	0.64	0.71	10	0.64	0.58	10	0.49	0.45	9
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	0.48	0.54	12	0.48	0.53	10	0.39	0.36	8
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.1	0	0.67	0.75	11	0.67	0.62	8	0.52	0.48	8
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01				<0.01							0.54				
Metals																	
Calcium	mg/L	0.5				0.7							44				
Calcium (filtered)	mg/L	0.5	<1	<1	0	<1			44	45	2	44			5	3	50
Magnesium	mg/L	0.5				2.3							<0.5				
Magnesium (filtered)	mg/L	0.5	2	3	40	2			<1	<1	0	<1			1	1	0
Potassium	mg/L	0.5				1.4							1.0				
Potassium (filtered)	mg/L	0.5	2	2	0	2			1	1	0	1			2	1	67
Organic																	
Dissolved Organic Carbon	mg/L	1	6	5	18	6			14	16	13	14			26	26	0
Dissolved Organic Carbon (filtered)	mg/L	1				6.5							16				

Field ID		0958_MW104I_210428	0958_QC205_210428		0958_MW120I_210428	0958_QC106_210428		0958_MW120I_210428	0958_QC206_210428		0958_MW307_210428	0958_QC107_210428		0958_MW307_210428	0958_QC207_210428		
Date		28/04/2021	28/04/2021		28/04/2021	28/04/2021		28/04/2021	28/04/2021		28/04/2021	28/04/2021		28/04/2021	28/04/2021		
Matrix Type		Water	Water		Water	Water		Water	Water		Water	Water		Water	Water		
Lab Report Number		EP2104665	791819	RPD	EP2104679	EP2104679	RPD	EP2104679	791819	RPD	EP2104665	EP2104665	RPD	EP2104665	791819	RPD	
	Unit	LOR - Limit of Reporting															
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		<0.01					<0.01						0.21		
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.04	0.02	67	<0.02	<0.02	0	<0.02	<0.01	0	0.76	0.64	17	0.76	0.61	22
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.03	0.02	40	<0.02	<0.02	0	<0.02	<0.01	0	0.80	0.87	8	0.80	0.74	8
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.26	0.17	42	<0.02	<0.02	0	<0.02	<0.01	0	5.54	4.65	17	5.54	5.1	8
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	0.42	0.44	5	0.42	0.20	71
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.13	0.12	8	<0.01	<0.01	0	<0.01	<0.01	0	11.0	10.5	5	11.0	20	58
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		<0.01						<0.01						0.07	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0	0.3	0.2	40	0.3	0.28	7
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.05	0.04	22	<0.02	<0.02	0	<0.02	<0.01	0	2.21	1.81	20	2.21	2.0	10
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	0.59	0.53	11	0.59	0.67	13
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	0.37	0.33	11	0.37	0.28	28
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.01	0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	0.41	0.38	8	0.41	0.43	5
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	0.10	0.09	11	0.10	0.11	10
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
PFAS - Perfluoroalkyl Sulfonamides																	
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS																	
Sum of PFAS (WA DER List)	µg/L	0.01	0.49	0.37	28	<0.01	<0.01	0	<0.01	<0.05	0	21.3	19.1	11	21.3	29.48	32
Sum of PFHxS and PFOS	µg/L	0.01	0.39	0.29	29	<0.01	<0.01	0	<0.01	<0.01	0	16.5	15.2	8	16.5	25.1	41
Sum of PFAS	µg/L	0.01	0.52	0.39	29	<0.01	<0.01	0	<0.01	<0.1	0	22.5	20.4	10	22.5	30.7	31
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01		0.3						<0.01						25.53	
Metals																	
Calcium	mg/L	0.5		1.8						4.8						7.8	
Calcium (filtered)	mg/L	0.5	5			6	5	18	6			8	8	0	8		
Magnesium	mg/L	0.5		0.9						2.1						2.8	
Magnesium (filtered)	mg/L	0.5	1			2	2	0	2			3	3	0	3		
Potassium	mg/L	0.5		0.9						0.5						1.2	
Potassium (filtered)	mg/L	0.5	2			<1	<1	0	<1			2	1	67	2		
Organic																	
Dissolved Organic Carbon	mg/L	1	26			21	21	0	21			14	15	7	14		
Dissolved Organic Carbon (filtered)	mg/L	1		23						20						16	

APPENDIX

C

LABORATORY CERTIFICATES OF ANALYSIS



CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 376 085 521

☐ Sydney Laboratory
Unit F3 Bld F 18 Mars Road Lane Cove NSW 2066
02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
Unit 1 21 Smallwood Place Murarie QLD 4172
07 3902 4800 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
Unit 2 91 Leach Highway Kewdale WA 6105
08 9251 9000 EnviroSampleWA@eurofins.com

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

Company CARDNO			Project No WA_0958_PFASOMP			Project Manager [REDACTED]			Sampler(s) [REDACTED]					
Address 11 harvest Tce WEST PERTH			Project Name WA_0958_PFASOMP			EDD Format ESdat, EQuIS etc			ESdat					
Contact Name [REDACTED]			<div>Analyses Where metals are requested, please specify "Total" or "Filtered". SUITE code must be used to attract SUITE pricing.</div> <div>Full PFAS suite</div> <div>(water) Major anions & cations</div> <div>(water) DOC, TSS, pH</div> <div>(water) TOC, TSS, pH</div>			Email for Invoice [REDACTED]			Email for Results [REDACTED]					
Phone No [REDACTED]						Containers Change container type & size if necessary.			Required Turnaround Time (TAT) Default will be 5 days if not ticked					
Special Directions Please send ESdat report to [REDACTED] with the project ID in the header file.						500mL Plastic			500mL Plastic			500mL Plastic		
Purchase Order DEF19009/330						125mL Plastic			200mL Amber Glass			40mL VOA vial		
Quote ID No			500mL PFAS Bottle			Jar (Glass or HDPE)			Other (Asbestos AS4984, WA Guidelines)					
									*Surcharge will apply					
									☐ Overnight (reporting by 9am) ♦					
									☐ Same day ♦ ☐ 1 day ♦					
									☐ 2 days ♦ ☐ 3 days ♦					
									☒ 5 days (Standard)					
									☐ Other()					
									Sample Comments / Dangerous Goods Hazard Warning					
No	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)											
1	0958_QC201-210427	27-4-21	W	X	X	X								
2	0958_QC202-210427	27-4-21	W	X	X	X								
3	0958-QC203-210427	27-4-21	W	X	X	X								
4														
5														
6														
7														
8														
9														
10														
Total Counts														
Method of Shipment				☐ Courier (#) ☐ Hand Delivered ☐ Postal				Name						
								Signature						
								Date						
								Time						
								Temperature						
								Report No						
Laboratory Use Only				Received By [REDACTED] SYD BNE MEL PER ADL NTL DRW				Signature [REDACTED]						
				Received By [REDACTED] SYD BNE MEL PER ADL NTL DRW				Signature [REDACTED]						
								Date 28/4/21						
								Time 05:45						
								Temperature 17.1°C						
								Report No 71818						

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

Australia

Melbourne

6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney

Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane

1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth

46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle

4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland

35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: Cardno (WA)
Contact name: [REDACTED]
Project name: WA_0958_PFASOMP
Project ID: Not provided
Turnaround time: 5 Day
Date/Time received: May 1, 2021 3:45 PM
Eurofins reference: 791818

Sample Information

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

Notes

Contact

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

[REDACTED] on phone : [REDACTED] or by email: [REDACTED]

Results will be delivered electronically via email to [REDACTED] - [REDACTED]@cardno.com.au.

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

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005
Project Name: WA_0958_PFASOMP

Order No.: DEF19009/330
Report #: 791818
Phone: [REDACTED]
Fax: [REDACTED]

Received: May 1, 2021 3:45 PM
Due: May 10, 2021
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Major Anions	Major Cations	Per- and Polyfluoroalkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
Mayfield Laboratory - NATA Site # 25079												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	0958_QC201_210427	Apr 27, 2021		Water	M21-My00920	X	X	X	X	X	X	X
2	0958_QC202_210427	Apr 27, 2021		Water	M21-My00921	X	X	X	X	X	X	X
3	0958_QC203_210427	Apr 27, 2021		Water	M21-My00922	X	X	X	X	X	X	X
Test Counts						3	3	3	3	3	3	3



CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ Sydney Laboratory

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

☐ Brisbane Laboratory

Unit 1 21 Smallwood Place Murarie QLD 4172
07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory

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

☐ Melbourne Laboratory

6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

Company	CARDNO	Project No	WA_0958_PFASOMP	Project Manager		Sampler(s)				
Address	11 harvest Tce WEST PERTH	Project Name	WA_0958_PFASOMP	EDD Format ESdat, EQuIS etc	ESdat	Handed over by	ALS			
Contact Name		Analyses Where metals are requested, please specify Total* or "Filtered" SUITE code must be used to attract SUITE pricing	Full PFAS suite (water) Major anions & cations (water) DOC, TSS, pH (sediment) TOC, CEC, pH			Email for Invoice				
Phone No						Email for Results				
Special Directions	Please send ESdat report to with the project ID in the header file.					Container Change container type & size if necessary.		Turnaround Time (TAT) Default will be 5 days if not ticked.		
Purchase Order	DEF19009/330					500mL Plastic 250mL Plastic 125mL Plastic 200mL Amber Glass 40mL VOA vial 500mL PFAS Bottle Jar (Glass or HDPE) Other (Asbestos AS4964, WA Guidelines)		☐ Overnight (reporting by 9am) ♦ ☐ Same day ♦ ☐ 1 day ♦ ☐ 2 days ♦ ☐ 3 days ♦ ☒ 5 days (Standard) ☐ Other()		
Quote ID No										
No	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)				Sample Comments / Dangerous Goods Hazard Warning			
1	0958_QC204-210428	28-4-21	W	X	X	X				
2	0958-QC205-210428	28-4-21	W	X	X	X				
3	0958-QC206-210428	28-4-21	W	X	X	X				
4	0958-QC207-210428	28-4-21	W	X	X	X				
5										
6										
7										
8										
9										
10										
Total Counts										
Method of Shipment	☐ Courier (#) ☐ Hand Delivered ☐ Postal	Name		Signature		Date		Time		
Laboratory Use Only	Received By	SYD BNE MEL PER ADL NTL DRW	Signature		Date	29/4/21	Time	15:57	Temperature	123°
	Received By	SYD BNE MEL PER ADL NTL DRW	Signature		Date		Time		Report No	

Eurofins Environment Testing Australia Pty Ltd

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

791819

Australia

Melbourne

6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney

Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
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1/21 Smallwood Place
Murarrie QLD 4172
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NATA # 1261
Site # 23736

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4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

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Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: Cardno (WA)
Contact name: [REDACTED]
Project name: WA_0958_PFASOMP
Project ID: Not provided
Turnaround time: 5 Day
Date/Time received: Apr 29, 2021 3:07 PM
Eurofins reference: 791819

Sample Information

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

Notes

Contact

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

[REDACTED] on phone : [REDACTED] or by email: [REDACTED]

Results will be delivered electronically via email to [REDACTED] - [REDACTED]@cardno.com.au.

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

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

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Murarrie QLD 4172
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Phone : +61 8 9251 9600
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Site # 23736

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PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005
Project Name: WA_0958_PFASOMP

Order No.: DEF19009/330
Report #: 791819
Phone: [REDACTED]
Fax: [REDACTED]

Received: Apr 29, 2021 3:07 PM
Due: May 6, 2021
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Eurofins Suite B11	Per- and Polyfluoroalkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 23736											
Mayfield Laboratory - NATA Site # 25079											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	0958_QC204_210428	Apr 28, 2021		Water	M21-My00923	X	X	X	X	X	X
2	0958_QC205_210428	Apr 28, 2021		Water	M21-My00924	X	X	X	X	X	X
3	0958_QC206_210428	Apr 28, 2021		Water	M21-My00925	X	X	X	X	X	X
4	0958_QC207_210428	Apr 28, 2021		Water	M21-My00926	X	X	X	X	X	X
Test Counts						4	4	4	4	4	4

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection and proficiency testing scheme providers
reports.

Attention:

Report **791819-W**
Project name **WA_0958_PFASOMP**
Received Date **Apr 29, 2021**

Client Sample ID			0958_QC204_2 10428	0958_QC205_2 10428	0958_QC206_2 10428	0958_QC207_2 10428
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M21-My00923	M21-My00924	M21-My00925	M21-My00926
Date Sampled			Apr 28, 2021	Apr 28, 2021	Apr 28, 2021	Apr 28, 2021
Test/Reference	LOR	Unit				
Ammonia (as N)	0.01	mg/L	0.74	0.25	< 0.1	< 0.01
Chloride	1	mg/L	30	19	23	29
Dissolved Organic Carbon	5	mg/L	16	23	20	16
Nitrate (as N)	0.02	mg/L	0.13	< 0.02	G01< 0.5	3.5
pH (at 25 °C)	0.1	pH Units	6.7	6.1	5.6	4.6
Sulphate (as SO4)	5	mg/L	44	13	11	7.9
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	190	160	110	120
Total Suspended Solids Dried at 103–105°C	1	mg/L	43	10	27	980
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	72	< 20	< 20	< 20
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	< 10	< 10	< 10
Alkali Metals						
Calcium	0.5	mg/L	44	1.8	4.8	7.8
Magnesium	0.5	mg/L	< 0.5	0.9	2.1	2.8
Potassium	0.5	mg/L	1.0	0.9	0.5	1.2
Sodium	0.5	mg/L	8.9	17	6.8	15
Perfluoroalkyl carboxylic acids (PFCA)						
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	0.28
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	N090.01	N090.01	< 0.01	N090.67
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	N090.02	N090.04	< 0.01	N092.0
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	N090.28
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	N090.01	N090.01	< 0.01	N090.43
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTeDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	71	70	65	73
13C5-PFPeA (surr.)	1	%	73	71	67	65
13C5-PFHxA (surr.)	1	%	85	90	88	89
13C4-PFHpA (surr.)	1	%	92	100	92	93
13C8-PFOA (surr.)	1	%	91	92	88	80
13C5-PFNA (surr.)	1	%	97	94	97	97
13C6-PFDA (surr.)	1	%	78	78	70	57
13C2-PFUnDA (surr.)	1	%	71	63	60	55

Client Sample ID			0958_QC204_2 10428	0958_QC205_2 10428	0958_QC206_2 10428	0958_QC207_2 10428
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M21-My00923	M21-My00924	M21-My00925	M21-My00926
Date Sampled			Apr 28, 2021	Apr 28, 2021	Apr 28, 2021	Apr 28, 2021
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C2-PFDoDA (surr.)	1	%	53	38	44	50
13C2-PFTeDA (surr.)	1	%	32	22	29	33
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	91	73	75	72
D3-N-MeFOSA (surr.)	1	%	50	37	40	33
D5-N-EtFOSA (surr.)	1	%	49	35	39	32
D7-N-MeFOSE (surr.)	1	%	75	66	59	56
D9-N-EtFOSE (surr.)	1	%	74	65	60	54
D5-N-EtFOSAA (surr.)	1	%	62	58	48	62
D3-N-MeFOSAA (surr.)	1	%	86	88	84	86
Perfluoroalkyl sulfonic acids (PFASs)						
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	0.01	0.02	< 0.01	0.61
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	0.07
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	0.21
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	N090.02	N090.02	< 0.01	N090.74
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	N090.20	N090.17	< 0.01	N095.1
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	N090.02	< 0.01	< 0.01	N090.20
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	N090.33	N090.12	< 0.01	N0920
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	94	91	95	85
18O2-PFHxS (surr.)	1	%	90	87	86	92
13C8-PFOS (surr.)	1	%	77	71	71	58
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	0.11
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	49	48	45	52
13C2-6:2 FTSA (surr.)	1	%	86	90	74	81
13C2-8:2 FTSA (surr.)	1	%	87	78	74	73
13C2-10:2 FTSA (surr.)	1	%	86	85	62	69

Client Sample ID			0958_QC204_2 10428	0958_QC205_2 10428	0958_QC206_2 10428	0958_QC207_2 10428
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			M21-My00923	M21-My00924	M21-My00925	M21-My00926
Date Sampled			Apr 28, 2021	Apr 28, 2021	Apr 28, 2021	Apr 28, 2021
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	0.53	0.29	< 0.01	25.1
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.34	0.13	< 0.01	20.43
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.54	0.3	< 0.01	25.53
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.58	0.37	< 0.05	29.48
Sum of PFASs (n=30)*	0.1	ug/L	0.62	0.39	< 0.1	30.7

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11			
Ammonia (as N) - Method: APHA 4500-NH3 Ammonia Nitrogen by FIA	Melbourne	May 04, 2021	28 Days
Chloride - Method: LTM-INO-4090 Chloride by Discrete Analyser	Melbourne	May 04, 2021	28 Days
Nitrate (as N) - Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA	Melbourne	May 04, 2021	28 Days
Sulphate (as SO4) - Method: LTM-INO-4110 Sulfate by Discrete Analyser	Melbourne	May 04, 2021	28 Days
Alkalinity (speciated) - Method: LTM-INO-4250 Alkalinity by Electrometric Titration	Melbourne	May 04, 2021	14 Days
Alkali Metals - Method: LTM-MET-3010 Alkali Metals Sulfur Silicon Phosphorus by ICP-AES	Melbourne	May 04, 2021	180 Days
Dissolved Organic Carbon - Method: APHA 5310B Dissolved Organic Carbon	Melbourne	May 04, 2021	28 Days
pH (at 25 °C) - Method: LTM-GEN-7090 pH in water by ISE	Melbourne	May 04, 2021	0 Hours
Total Suspended Solids Dried at 103–105°C - Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry	Melbourne	May 04, 2021	7 Days
Total Dissolved Solids Dried at 180°C ± 2°C - Method: LTM-INO-4170 Total Dissolved Solids in Water	Melbourne	May 04, 2021	7 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
Perfluoroalkyl sulfonic acids (PFASs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
PFASs Summations - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 01, 2021	

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005
Project Name: WA_0958_PFASOMP

Order No.: DEF19009/330
Report #: 791819
Phone: [REDACTED]
Fax: [REDACTED]

Received: Apr 29, 2021 3:07 PM
Due: May 6, 2021
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Eurofins Suite B11	Per- and Polyfluoroalkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 23736											
Mayfield Laboratory - NATA Site # 25079											
External Laboratory											
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID						
1	0958_QC204_210428	Apr 28, 2021		Water	M21-My00923	X	X	X	X	X	X
2	0958_QC205_210428	Apr 28, 2021		Water	M21-My00924	X	X	X	X	X	X
3	0958_QC206_210428	Apr 28, 2021		Water	M21-My00925	X	X	X	X	X	X
4	0958_QC207_210428	Apr 28, 2021		Water	M21-My00926	X	X	X	X	X	X
Test Counts						4	4	4	4	4	4

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Ammonia (as N)	mg/L	0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 10			10	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Ammonia (as N)	%	103			70-130	Pass	
Chloride	%	116			70-130	Pass	
Nitrate (as N)	%	99			70-130	Pass	
Sulphate (as SO4)	%	99			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	95			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	101			70-130	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	92			80-120	Pass	
Magnesium	%	95			80-120	Pass	
Potassium	%	94			80-120	Pass	
Sodium	%	95			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	94			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	109			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	93			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	78			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	96			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	86			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	87			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	105			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	107			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	86			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	64			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	83			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	100			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	75			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	90			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	97			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	97			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	98			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	77			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	92			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	91			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	85			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	83			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	81			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	91			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	81			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	94			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	112			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	108			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	99			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	B21-Ap50583	NCP	%	87			70-130	Pass	
Nitrate (as N)	B21-Ap50583	NCP	%	94			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Carbonate Alkalinity (as CaCO ₃)	M21-My02680	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M21-My02953	NCP	%	80			75-125	Pass	
Magnesium	M21-My02953	NCP	%	86			75-125	Pass	
Potassium	M21-My02953	NCP	%	80			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M21-My02171	NCP	%	97			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M21-My02171	NCP	%	112			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M21-My02171	NCP	%	98			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-My02171	NCP	%	81			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M21-My02171	NCP	%	100			50-150	Pass	
Perfluorononanoic acid (PFNA)	M21-My02171	NCP	%	92			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M21-My02171	NCP	%	92			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M21-My02171	NCP	%	107			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M21-My02171	NCP	%	110			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M21-My02171	NCP	%	97			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M21-My02171	NCP	%	67			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M21-My02171	NCP	%	89			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-My02171	NCP	%	108			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-My02171	NCP	%	102			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-My02171	NCP	%	100			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-My02171	NCP	%	105			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-My02171	NCP	%	115			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-My02171	NCP	%	105			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M21-My02171	NCP	%	89			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M21-My02171	NCP	%	99			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M21-My02171	NCP	%	101			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoropentanesulfonic acid (PFPeS)	M21-My02171	NCP	%	89			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M21-My02171	NCP	%	96			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M21-My02171	NCP	%	82			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M21-My02171	NCP	%	103			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M21-My02171	NCP	%	89			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-My02171	NCP	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-My02171	NCP	%	109			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-My02171	NCP	%	105			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-My02171	NCP	%	108			50-150	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Sodium	M21-My00924	CP	%	87			75-125	Pass	
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103–105°C	M21-My00925	CP	%	173			70-130	Fail	Q08
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	B21-Ap50583	NCP	mg/L	0.02	0.02	19	30%	Pass	
Chloride	S21-Ap54418	NCP	mg/L	8800	9100	4.0	30%	Pass	
Nitrate (as N)	B21-Ap50583	NCP	mg/L	0.80	0.80	1.0	30%	Pass	
pH (at 25 °C)	P21-Ap56342	NCP	pH Units	7.8	7.8	pass	30%	Pass	
Sulphate (as SO4)	S21-Ap54418	NCP	mg/L	650	670	2.0	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	M21-My00685	NCP	mg/L	3600	3500	2.4	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	P21-Ap56342	NCP	mg/L	320	310	5.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	P21-Ap56342	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M21-My02953	NCP	mg/L	27	27	<1	30%	Pass	
Magnesium	M21-My02953	NCP	mg/L	25	25	1.0	30%	Pass	
Potassium	M21-My02953	NCP	mg/L	5.9	6.0	2.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M21-My02953	NCP	ug/L	0.01	0.02	5.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorodecanoic acid (PFDA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M21-My02953	NCP	ug/L	0.02	0.02	21	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-My02953	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Total Suspended Solids Dried at 103–105°C	M21-My00925	CP	mg/L	27	29	5.0	30%	Pass

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Authorised by:

	Analytical Services Manager
	Senior Analyst-Metal (VIC)
	Senior Analyst-PFAS (VIC)
	Senior Analyst-Inorganic (VIC)



General Manager

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

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Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection and proficiency testing scheme providers
reports.

Attention:



Report **791818-W**
Project name **WA_0958_PFSOMP**
Received Date **May 01, 2021**

Client Sample ID			0958_QC201_2 10427	0958_QC202_2 10427	0958_QC203_2 10427
Sample Matrix			Water	Water	Water
Eurofins Sample No.			M21-My00920	M21-My00921	M21-My00922
Date Sampled			Apr 27, 2021	Apr 27, 2021	Apr 27, 2021
Test/Reference	LOR	Unit			
Ammonia (as N)	0.01	mg/L	0.53	0.18	0.35
Chloride	1	mg/L	100	73	47
Dissolved Organic Carbon	5	mg/L	16	43	6.5
Nitrate (as N)	0.02	mg/L	< 0.02	< 0.2	< 0.02
pH (at 25 °C)	0.1	pH Units	6.0	4.1	5.6
Sulphate (as SO ₄)	5	mg/L	< 5	21	< 5
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	160	290	160
Total Suspended Solids Dried at 103–105°C	1	mg/L	< 1	26	97
Alkalinity (speciated)					
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20	< 20
Carbonate Alkalinity (as CaCO ₃)	10	mg/L	< 10	< 10	< 10
Alkali Metals					
Calcium	0.5	mg/L	0.9	3.0	0.7
Magnesium	0.5	mg/L	3.4	7.2	2.3
Potassium	0.5	mg/L	1.2	2.2	1.4
Sodium	0.5	mg/L	56	41	26
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	^{N09} 0.03	< 0.01	< 0.01
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	^{N09} 0.09	0.01	< 0.01
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	^{N09} 0.01	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	^{N09} 0.03	< 0.01	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTeDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	75	67	77
13C5-PFPeA (surr.)	1	%	72	68	77
13C5-PFHxA (surr.)	1	%	93	83	96
13C4-PFHpA (surr.)	1	%	97	91	99
13C8-PFOA (surr.)	1	%	90	88	94
13C5-PFNA (surr.)	1	%	93	96	102
13C6-PFDA (surr.)	1	%	73	77	79
13C2-PFUnDA (surr.)	1	%	66	67	69

Client Sample ID			0958_QC201_2 10427	0958_QC202_2 10427	0958_QC203_2 10427
Sample Matrix			Water	Water	Water
Eurofins Sample No.			M21-My00920	M21-My00921	M21-My00922
Date Sampled			Apr 27, 2021	Apr 27, 2021	Apr 27, 2021
Test/Reference	LOR	Unit			
Perfluoroalkyl carboxylic acids (PFCAs)					
13C2-PFDoDA (surr.)	1	%	54	45	52
13C2-PFTeDA (surr.)	1	%	33	24	34
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	76	65	81
D3-N-MeFOSA (surr.)	1	%	40	32	44
D5-N-EtFOSA (surr.)	1	%	36	30	43
D7-N-MeFOSE (surr.)	1	%	69	52	71
D9-N-EtFOSE (surr.)	1	%	67	51	71
D5-N-EtFOSAA (surr.)	1	%	92	46	58
D3-N-MeFOSAA (surr.)	1	%	105	69	99
Perfluoroalkyl sulfonic acids (PFASs)					
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	0.06	< 0.01	< 0.01
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	0.02	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	^{N09} 0.06	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	^{N09} 0.46	^{N09} 0.07	< 0.01
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	^{N09} 0.02	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	^{N09} 0.36	^{N09} 0.19	< 0.01
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	93	89	95
18O2-PFHxS (surr.)	1	%	87	87	91
13C8-PFOS (surr.)	1	%	70	71	77
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	49	43	56
13C2-6:2 FTSA (surr.)	1	%	87	79	83
13C2-8:2 FTSA (surr.)	1	%	91	79	82
13C2-10:2 FTSA (surr.)	1	%	125	78	101

Client Sample ID			0958_QC201_2 10427	0958_QC202_2 10427	0958_QC203_2 10427
Sample Matrix			Water	Water	Water
Eurofins Sample No.			M21-My00920	M21-My00921	M21-My00922
Date Sampled			Apr 27, 2021	Apr 27, 2021	Apr 27, 2021
Test/Reference	LOR	Unit			
PFASs Summations					
Sum (PFHxS + PFOS)*	0.01	ug/L	0.82	0.26	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.39	0.19	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.85	0.26	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	1.04	0.27	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	1.14	0.27	< 0.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

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

Description	Testing Site	Extracted	Holding Time
Major Cations			
Ammonia (as N) - Method: APHA 4500-NH3 Ammonia Nitrogen by FIA	Melbourne	May 04, 2021	28 Days
Alkali Metals - Method: LTM-MET-3010 Alkali Metals Sulfur Silicon Phosphorus by ICP-AES	Melbourne	May 04, 2021	180 Days
Major Anions			
Chloride - Method: LTM-INO-4090 Chloride by Discrete Analyser	Melbourne	May 04, 2021	28 Days
Nitrate (as N) - Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA	Melbourne	May 04, 2021	28 Days
Sulphate (as SO4) - Method: LTM-INO-4110 Sulfate by Discrete Analyser	Melbourne	May 04, 2021	28 Days
Alkalinity (speciated) - Method: LTM-INO-4250 Alkalinity by Electrometric Titration	Melbourne	May 04, 2021	14 Days
Dissolved Organic Carbon - Method: APHA 5310B Dissolved Organic Carbon	Melbourne	May 04, 2021	28 Days
pH (at 25 °C) - Method: LTM-GEN-7090 pH in water by ISE	Melbourne	May 04, 2021	0 Hours
Total Suspended Solids Dried at 103–105°C - Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry	Melbourne	May 04, 2021	7 Days
Total Dissolved Solids Dried at 180°C ± 2°C - Method: LTM-INO-4170 Total Dissolved Solids in Water	Melbourne	May 04, 2021	7 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
Perfluoroalkyl sulfonic acids (PFASs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 04, 2021	14 Days
PFASs Summations - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Melbourne	May 01, 2021	

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005
Project Name: WA_0958_PFASOMP

Order No.: DEF19009/330
Report #: 791818
Phone: [REDACTED]
Fax: [REDACTED]

Received: May 1, 2021 3:45 PM
Due: May 10, 2021
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Major Anions	Major Cations	Per- and Polyfluoroalkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794												
Perth Laboratory - NATA Site # 23736												
Mayfield Laboratory - NATA Site # 25079												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	0958_QC201_210427	Apr 27, 2021		Water	M21-My00920	X	X	X	X	X	X	X
2	0958_QC202_210427	Apr 27, 2021		Water	M21-My00921	X	X	X	X	X	X	X
3	0958_QC203_210427	Apr 27, 2021		Water	M21-My00922	X	X	X	X	X	X	X
Test Counts						3	3	3	3	3	3	3

Internal Quality Control Review and Glossary

General

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

Holding Times

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

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

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

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

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

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

Units

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

Terms

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

QC - Acceptance Criteria

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

Results <10 times the LOR : No Limit

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

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

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

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

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

QC Data General Comments

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

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 10			10	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTriDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Ammonia (as N)	%	102			70-130	Pass	
Chloride	%	103			70-130	Pass	
Nitrate (as N)	%	98			70-130	Pass	
Sulphate (as SO4)	%	99			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	87			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	95			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	101			70-130	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	92			80-120	Pass	
Magnesium	%	95			80-120	Pass	
Potassium	%	94			80-120	Pass	
Sodium	%	95			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	94			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	109			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	93			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	78			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	97			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	86			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	87			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	105			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	107			50-150	Pass	
Perfluorotridecanoic acid (PFTriDA)	%	86			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	64			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	83			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	100			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	75			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	90			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	97			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	97			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	98			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	77			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	92			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	91			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	85			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	83			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	81			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	91			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	81			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)							

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	94			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	112			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	108			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	99			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	B21-My04864	NCP	%	90			70-130	Pass	
Nitrate (as N)	B21-My04864	NCP	%	99			70-130	Pass	
Total Suspended Solids Dried at 103-105°C	N21-Ap52725	NCP	%	94			70-130	Pass	
Spike - % Recovery									
				Result 1					
Carbonate Alkalinity (as CaCO ₃)	M21-My02680	NCP	%	83			70-130	Pass	
Spike - % Recovery									
				Result 1					
Alkali Metals									
Calcium	M21-My02953	NCP	%	80			75-125	Pass	
Magnesium	M21-My02953	NCP	%	86			75-125	Pass	
Potassium	M21-My02953	NCP	%	80			75-125	Pass	
Sodium	M21-My02953	NCP	%	89			75-125	Pass	
Spike - % Recovery									
				Result 1					
Perfluoroalkyl carboxylic acids (PFCAs)									
Perfluorobutanoic acid (PFBA)	M21-My02171	NCP	%	97			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M21-My02171	NCP	%	112			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M21-My02171	NCP	%	98			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-My02171	NCP	%	81			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M21-My02171	NCP	%	100			50-150	Pass	
Perfluorononanoic acid (PFNA)	M21-My02171	NCP	%	92			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M21-My02171	NCP	%	92			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M21-My02171	NCP	%	107			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M21-My02171	NCP	%	110			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M21-My02171	NCP	%	97			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M21-My02171	NCP	%	67			50-150	Pass	
Spike - % Recovery									
				Result 1					
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)	M21-My02171	NCP	%	89			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-My02171	NCP	%	108			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-My02171	NCP	%	102			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-My02171	NCP	%	100			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-My02171	NCP	%	105			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-My02171	NCP	%	115			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-My02171	NCP	%	105			50-150	Pass	
Spike - % Recovery									
				Result 1					
Perfluoroalkyl sulfonic acids (PFSAs)									
Perfluorobutanesulfonic acid (PFBS)	M21-My02171	NCP	%	89			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorononanesulfonic acid (PFNS)	M21-My02171	NCP	%	99			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M21-My02171	NCP	%	101			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M21-My02171	NCP	%	89			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M21-My02171	NCP	%	96			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M21-My02171	NCP	%	82			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M21-My02171	NCP	%	103			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M21-My02171	NCP	%	89			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-My02171	NCP	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-My02171	NCP	%	109			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-My02171	NCP	%	105			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-My02171	NCP	%	108			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	B21-My04864	NCP	mg/L	3.7	3.8	1.0	30%	Pass	
Chloride	M21-My05949	NCP	mg/L	6000	6000	<1	30%	Pass	
Nitrate (as N)	B21-My04864	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
pH (at 25 °C)	P21-Ap56342	NCP	pH Units	7.8	7.8	pass	30%	Pass	
Sulphate (as SO4)	M21-My05949	NCP	mg/L	1600	1600	1.0	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	M21-My00920	CP	mg/L	160	130	19	30%	Pass	
Total Suspended Solids Dried at 103–105°C	M21-My00927	NCP	mg/L	310	280	8.0	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	P21-Ap56342	NCP	mg/L	320	310	5.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	P21-Ap56342	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M21-My02953	NCP	mg/L	27	27	<1	30%	Pass	
Magnesium	M21-My02953	NCP	mg/L	25	25	1.0	30%	Pass	
Potassium	M21-My02953	NCP	mg/L	5.9	6.0	2.0	30%	Pass	
Sodium	M21-My02953	NCP	mg/L	55	54	3.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCA)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M21-My02954	NCP	ug/L	0.92	0.90	2.0	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M21-My02953	NCP	ug/L	0.01	0.02	5.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-My02954	NCP	ug/L	0.85	0.81	5.0	30%	Pass	
Perfluorooctanoic acid (PFOA)	M21-My02953	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M21-My02954	NCP	ug/L	0.08	0.08	7.0	30%	Pass	
Perfluorodecanoic acid (PFDA)	M21-My02954	NCP	ug/L	0.01	< 0.01	13	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluoroundecanoic acid (PFUnDA)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M21-My02954	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-My02954	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-My02954	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-My02954	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-My02954	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-My02954	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-My02954	NCP	ug/L	0.28	0.31	10	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M21-My02954	NCP	ug/L	0.49	0.49	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M21-My02954	NCP	ug/L	0.32	0.33	3.0	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M21-My02954	NCP	ug/L	0.26	0.24	9.0	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M21-My02954	NCP	ug/L	0.41	0.39	6.0	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	M21-My02954	NCP	ug/L	0.05	0.05	5.0	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M21-My02954	NCP	ug/L	1.1	1.1	1.0	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-My02954	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-My02954	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments
Sample Integrity

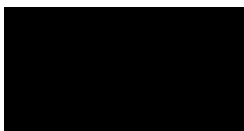
Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted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

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

	Analytical Services Manager
	Senior Analyst-Inorganic (VIC)
	Senior Analyst-Metal (VIC)
	Senior Analyst-PFAS (VIC)


General Manager

- Indicates Not Requested

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

Measurement uncertainty of test data is available on request or please [click here](#).

Eurofins shall not be liable for loss, cost, damages or expenses incurred by the client, or any other person or company, resulting from the use of any information or interpretation given in this report. In no case shall Eurofins be liable for consequential damages including, but not limited to, lost profits, damages for failure to meet deadlines and lost production arising from this report. This document shall not be reproduced except in full and relates only to the items tested. Unless indicated otherwise, the tests were performed on the samples as received.

CERTIFICATE OF ANALYSIS

Work Order : **EP2104577**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 22030
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 16
No. of samples analysed : 16

Page : 1 of 15
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 27-Apr-2021 16:40
Date Analysis Commenced : 29-Apr-2021
Issue Date : 10-May-2021 11:03



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EA025H (Suspended Solids): Sample #3 and #4 confirmed by re-preparation and re-analysis.
- ED041G (Turbidimetric Sulphate): LOR raised on sample #3 and #4 due to possible sample matrix interference.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits for sample #4 due to analytes not quantified in this report.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW140D_21042 7	0958_MW139I_21042 7	0958_MW138S_21042 7	0958_QC102_210427	0958_MW135I_21042 7
Sampling date / time				27-Apr-2021 09:57	27-Apr-2021 10:09	27-Apr-2021 10:31	27-Apr-2021 10:32	27-Apr-2021 11:41
Compound	CAS Number	LOR	Unit	EP2104577-001	EP2104577-002	EP2104577-003	EP2104577-004	EP2104577-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.01	6.25	4.41	4.35	6.02
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	212	93	265	282	104
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	12	22	22	93	90
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	190	14	<1	<1	9
Total Alkalinity as CaCO3	----	1	mg/L	190	14	<1	<1	9
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	1	<20	<20	19
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	39	45	81	70	40
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	64	<1	3	4	1
Magnesium	7439-95-4	1	mg/L	3	3	7	7	4
Sodium	7440-23-5	1	mg/L	25	28	43	42	31
Potassium	7440-09-7	1	mg/L	4	2	3	3	1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	4.90	1.57	2.28	1.97	1.70
∅ Total Cations	----	0.01	meq/L	4.63	1.52	2.67	2.68	1.75
∅ Ionic Balance	----	0.01	%	2.79	1.75	7.83	15.1	1.43
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	3	4	73	75	7
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.09	0.08	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW140D_21042 7	0958_MW139I_21042 7	0958_MW138S_21042 7	0958_QC102_210427	0958_MW135I_21042 7
Sampling date / time				27-Apr-2021 09:57	27-Apr-2021 10:09	27-Apr-2021 10:31	27-Apr-2021 10:32	27-Apr-2021 11:41
Compound	CAS Number	LOR	Unit	EP2104577-001	EP2104577-002	EP2104577-003	EP2104577-004	EP2104577-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.14	0.13	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW140D_21042 7	0958_MW139I_21042 7	0958_MW138S_21042 7	0958_QC102_210427	0958_MW135I_21042 7
Sampling date / time				27-Apr-2021 09:57	27-Apr-2021 10:09	27-Apr-2021 10:31	27-Apr-2021 10:32	27-Apr-2021 11:41
Compound	CAS Number	LOR	Unit	EP2104577-001	EP2104577-002	EP2104577-003	EP2104577-004	EP2104577-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.23	0.21	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.23	0.21	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.23	0.21	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	80.5	84.3	83.8	81.6	79.9
13C8-PFOA	----	0.02	%	95.5	96.8	95.1	94.4	97.1



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW136D_21042 7	0958_MW133D_21042 7	0958_MW131D_21042 7	0958_MW132I_21042 7	0958_MW130D_21042 7
Sampling date / time				27-Apr-2021 11:42	27-Apr-2021 12:43	27-Apr-2021 12:44	27-Apr-2021 12:57	27-Apr-2021 13:26
Compound	CAS Number	LOR	Unit	EP2104577-006	EP2104577-007	EP2104577-008	EP2104577-009	EP2104577-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.64	6.45	6.66	6.43	6.70
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	111	86	112	97	144
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	8	17	21	111	75
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	12	12	25	24	25
Total Alkalinity as CaCO3	----	1	mg/L	12	12	25	24	25
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	2	8	1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	43	25	42	19	44
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	1	4	<1	7
Magnesium	7439-95-4	1	mg/L	2	1	3	1	2
Sodium	7440-23-5	1	mg/L	27	20	27	24	26
Potassium	7440-09-7	1	mg/L	2	2	2	<1	5
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.45	0.94	1.72	1.18	1.76
∅ Total Cations	----	0.01	meq/L	1.49	1.05	1.67	1.13	1.77
∅ Ionic Balance	----	0.01	%	1.26	5.42	1.58	2.42	0.32
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	9	13	8	8	4
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.04
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.04	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW136D_21042 7	0958_MW133D_21042 7	0958_MW131D_21042 7	0958_MW132I_21042 7	0958_MW130D_21042 7
Sampling date / time				27-Apr-2021 11:42	27-Apr-2021 12:43	27-Apr-2021 12:44	27-Apr-2021 12:57	27-Apr-2021 13:26
Compound	CAS Number	LOR	Unit	EP2104577-006	EP2104577-007	EP2104577-008	EP2104577-009	EP2104577-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW136D_21042 7	0958_MW133D_21042 7	0958_MW131D_21042 7	0958_MW132I_21042 7	0958_MW130D_21042 7
Sampling date / time				27-Apr-2021 11:42	27-Apr-2021 12:43	27-Apr-2021 12:44	27-Apr-2021 12:57	27-Apr-2021 13:26
Compound	CAS Number	LOR	Unit	EP2104577-006	EP2104577-007	EP2104577-008	EP2104577-009	EP2104577-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	0.04	<0.01	<0.01	0.04
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.04	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	0.04	<0.01	<0.01	0.04
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	85.3	85.2	86.2	77.9	82.1
13C8-PFOA	----	0.02	%	94.5	97.7	97.9	94.1	96.9



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW128S_21042 7	0958_MW126I_21042 7	0958_MW125S_21042 7	0958_MW129I_21042 7	0958_QC103_210427
Sampling date / time				27-Apr-2021 14:13	27-Apr-2021 14:34	27-Apr-2021 14:52	27-Apr-2021 13:53	27-Apr-2021 13:55
Compound	CAS Number	LOR	Unit	EP2104577-011	EP2104577-012	EP2104577-013	EP2104577-014	EP2104577-015
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.82	6.32	5.96	5.84	6.12
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	118	113	97	112	186
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	134	15	35	86	649
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	3	16	7	6	8
Total Alkalinity as CaCO3	----	1	mg/L	3	16	7	6	8
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	23	<1	10	1	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	39	43	18	47	46
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	<1	<1	<1
Magnesium	7439-95-4	1	mg/L	3	3	3	2	3
Sodium	7440-23-5	1	mg/L	32	26	15	27	29
Potassium	7440-09-7	1	mg/L	1	3	<1	2	2
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.64	1.53	0.86	1.47	1.46
∅ Total Cations	----	0.01	meq/L	1.66	1.45	0.90	1.39	1.56
∅ Ionic Balance	----	0.01	%	0.77	2.61	2.48	2.67	3.38
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	10	4	13	6	5
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW128S_21042 7	0958_MW126I_21042 7	0958_MW125S_21042 7	0958_MW129I_21042 7	0958_QC103_210427
Sampling date / time				27-Apr-2021 14:13	27-Apr-2021 14:34	27-Apr-2021 14:52	27-Apr-2021 13:53	27-Apr-2021 13:55
Compound	CAS Number	LOR	Unit	EP2104577-011	EP2104577-012	EP2104577-013	EP2104577-014	EP2104577-015
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW128S_21042 7	0958_MW126I_21042 7	0958_MW125S_21042 7	0958_MW129I_21042 7	0958_QC103_210427
Sampling date / time				27-Apr-2021 14:13	27-Apr-2021 14:34	27-Apr-2021 14:52	27-Apr-2021 13:53	27-Apr-2021 13:55
Compound	CAS Number	LOR	Unit	EP2104577-011	EP2104577-012	EP2104577-013	EP2104577-014	EP2104577-015
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	80.3	85.7	81.8	81.4	84.6
13C8-PFOA	----	0.02	%	93.9	96.7	92.6	93.0	94.9



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0958_MW106S_21042
7

Sampling date / time

27-Apr-2021 15:17

Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	3.57	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	232	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	94	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	13	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	40	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	----	----	----	----
Magnesium	7439-95-4	1	mg/L	5	----	----	----	----
Sodium	7440-23-5	1	mg/L	21	----	----	----	----
Potassium	7440-09-7	1	mg/L	2	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.40	----	----	----	----
∅ Total Cations	----	0.01	meq/L	1.48	----	----	----	----
∅ Ionic Balance	----	0.01	%	2.67	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	73	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0958_MW106S_21042
7

Sampling date / time

27-Apr-2021 15:17

Compound

CAS Number

LOR

Unit

EP2104577-016

Result

EP231A: Perfluoroalkyl Sulfonic Acids - Continued

Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0958_MW106S_21042
7

Sampling date / time

27-Apr-2021 15:17

Compound

CAS Number

LOR

Unit

EP2104577-016

Result

EP231C: Perfluoroalkyl Sulfonamides - Continued

N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----
--	-----------	------	------	-------	------	------	------	------

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

EP231S: PFAS Surrogate

13C4-PFOS	----	0.02	%	80.8	----	----	----	----
13C8-PFOA	----	0.02	%	93.9	----	----	----	----

Page : 15 of 15
Work Order : EP2104577
Client : CARDNO (WA) PTY LTD
Project : WA_0958_PFASOMP



Surrogate Control Limits

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231C: Perfluoroalkyl Sulfonamides

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

(WATER) EP231P: PFAS Sums

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2104577	Page	: 1 of 10
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 27-Apr-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 29-Apr-2021
C-O-C number	: 22030	Issue Date	: 10-May-2021
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 16		
No. of samples analysed	: 16		



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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

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

Laboratory Duplicate (DUP) Report

Sub-Matrix: **WATER**

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3659734)									
EP2104577-005	0958_MW135I_210427	EA005-P: pH Value	----	0.01	pH Unit	6.02	6.08	0.992	0% - 20%
EP2104565-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.31	8.28	0.362	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3659738)									
EP2104577-015	0958_QC103_210427	EA005-P: pH Value	----	0.01	pH Unit	6.12	6.04	1.32	0% - 20%
EP2104671-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.11	7.12	0.140	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3656507)									
EP2104577-001	0958_MW140D_210427	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	212	219	3.25	0% - 20%
EP2104577-009	0958_MW132I_210427	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	97	80	19.5	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3656508)									
EP2104577-001	0958_MW140D_210427	EA025H: Suspended Solids (SS)	----	5	mg/L	12	14	11.5	No Limit
EP2104577-011	0958_MW128S_210427	EA025H: Suspended Solids (SS)	----	5	mg/L	134	137	2.40	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3659737)									
EP2104577-005	0958_MW135I_210427	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	9	9	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	9	9	0.00	No Limit
EP2104577-015	0958_QC103_210427	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	8	7	16.5	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	8	7	16.5	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3647691)									
EP2104577-001	0958_MW140D_210427	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
EP2104577-011	0958_MW128S_210427	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	23	24	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3647692)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED045G: Chloride by Discrete Analyser (QC Lot: 3647692) - continued									
EP2104577-001	0958_MW140D_210427	ED045G: Chloride	16887-00-6	1	mg/L	39	38	0.00	0% - 20%
EP2104577-011	0958_MW128S_210427	ED045G: Chloride	16887-00-6	1	mg/L	39	39	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3647210)									
EP2104539-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	100	90	10.6	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	10	9	11.1	0% - 50%
		ED093F: Sodium	7440-23-5	1	mg/L	84	77	8.96	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	7	6	0.00	No Limit
EP2104577-006	0958_MW136D_210427	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	3	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	27	27	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3647211)									
EP2104577-016	0958_MW106S_210427	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	5	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	21	22	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EP2104632-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	137	143	4.33	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	52	53	2.55	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	400	405	1.33	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	12	12	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3650557)									
EP2104577-001	0958_MW140D_210427	EP002: Dissolved Organic Carbon	----	1	mg/L	3	4	0.00	No Limit
EP2104577-011	0958_MW128S_210427	EP002: Dissolved Organic Carbon	----	1	mg/L	10	10	0.00	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3663620)									
EP2104578-005	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.25	0.21	16.3	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.08	0.07	15.5	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.09	0.07	14.3	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.64	0.54	16.9	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2104578-009	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3663620)									
EP2104578-005	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.03	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3663620) - continued									
EP2104578-005	Anonymous	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.16	0.14	11.2	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP2104578-009	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3663620)							
EP2104578-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP2104578-009	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8			0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3663620) - continued									
EP2104578-009	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3663620)									
EP2104578-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2104578-009	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3663620)									
EP2104578-005	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	1.32	1.12	16.4	0% - 20%
EP2104578-009	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3659734)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3659738)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3656507)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	90.0	88.1	114
				<10	1000 mg/L	100	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3656508)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	89.5	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3659737)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	89.0	81.2	126
				<1	200 mg/L	97.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3647691)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	107	87.7	113
				<1	500 mg/L	93.9	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3647692)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	100	87.9	114
				<1	1000 mg/L	99.6	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3647210)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	105	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	108	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.0	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3647211)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	105	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	108	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.0	89.7	108



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit						
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3650557)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	99.2	73.2	116
				<1	100 mg/L	97.7	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3663310)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	115	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	123	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	118	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	117	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	102	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	110	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3663620)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	121	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	119	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	127	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3663310)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	113	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	119	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	120	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	98.8	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	110	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	123	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3663620)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	117	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	115	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	122	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	130	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	134



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3663620) - continued								
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	120	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	128	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3663310)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	118	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	118	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	115	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	105	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	115	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	108	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	108	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3663620)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	119	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	122	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	110	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	101	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	114	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	125	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3663310)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	113	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	103	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	120	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	116	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3663620)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	119	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	121	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	107	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	107	71.4	144

Matrix Spike (MS) Report



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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3647691)							
EP2104577-001	0958_MW140D_210427	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	119	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3647692)							
EP2104577-001	0958_MW140D_210427	ED045G: Chloride	16887-00-6	1000 mg/L	98.6	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3650557)							
EP2104577-002	0958_MW139I_210427	EP002: Dissolved Organic Carbon	----	100 mg/L	101	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3663620)							
EP2104578-007	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	105	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	85.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	116	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	103	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	72.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3663620)							
EP2104578-007	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	118	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	121	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	120	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	109	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	109	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	110	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	119	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	121	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	120	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.25 µg/L	118	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	126	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3663620)							
EP2104578-007	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	111	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	118	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	109	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	102	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	117	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	122	65.0	136



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3663620) - continued							
EP2104578-007	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	120	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3663620)							
EP2104578-007	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	107	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	119	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	124	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	111	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2104577	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 27-Apr-2021
Site	: DEF19009/Gingin	Issue Date	: 10-May-2021
Sampler	: [REDACTED] [REDACTED]	No. of samples received	: 16
Order number	: DEF19009/330	No. of samples analysed	: 16

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Matrix: WATER

Outliers : Frequency of Quality Control Samples

Matrix: WATER

Analysis Holding Time Compliance

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

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

Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	05-May-2021	27-Apr-2021	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	04-May-2021	04-May-2021	✔
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	04-May-2021	04-May-2021	✔
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	05-May-2021	11-May-2021	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	07-May-2021 25-May-2021	✔
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	07-May-2021 25-May-2021	✔
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	30-Apr-2021 04-May-2021	✔
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002) 0958_MW140D_210427, 0958_MW138S_210427, 0958_MW135I_210427, 0958_MW133D_210427, 0958_MW132I_210427, 0958_MW128S_210427, 0958_MW125S_210427, 0958_QC103_210427,	0958_MW139I_210427, 0958_QC102_210427, 0958_MW136D_210427, 0958_MW131D_210427, 0958_MW130D_210427, 0958_MW126I_210427, 0958_MW129I_210427, 0958_MW106S_210427	27-Apr-2021	----	----	----	29-Apr-2021 25-May-2021	✔

Page : 5 of 9
 Work Order : EP2104577
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW140D_210427,	0958_MW139I_210427,							
0958_MW138S_210427,	0958_QC102_210427,							
0958_MW135I_210427,	0958_MW136D_210427,							
0958_MW133D_210427,	0958_MW131D_210427,							
0958_MW132I_210427,	0958_MW130D_210427,							
0958_MW128S_210427,	0958_MW126I_210427,							
0958_MW125S_210427,	0958_MW129I_210427,							
0958_QC103_210427,	0958_MW106S_210427							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW140D_210427,	0958_MW139I_210427,							
0958_MW138S_210427,	0958_QC102_210427,							
0958_MW135I_210427,	0958_MW136D_210427,							
0958_MW133D_210427,	0958_MW131D_210427,							
0958_MW132I_210427,	0958_MW130D_210427,							
0958_MW128S_210427,	0958_MW126I_210427,							
0958_MW125S_210427,	0958_MW129I_210427,							
0958_QC103_210427,	0958_MW106S_210427							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW140D_210427,	0958_MW139I_210427,							
0958_MW138S_210427,	0958_QC102_210427,							
0958_MW135I_210427,	0958_MW136D_210427,							
0958_MW133D_210427,	0958_MW131D_210427,							
0958_MW132I_210427,	0958_MW130D_210427,							
0958_MW128S_210427,	0958_MW126I_210427,							
0958_MW125S_210427,	0958_MW129I_210427,							
0958_QC103_210427,	0958_MW106S_210427							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW140D_210427,	0958_MW139I_210427,							
0958_MW138S_210427,	0958_QC102_210427,							
0958_MW135I_210427,	0958_MW136D_210427,							
0958_MW133D_210427,	0958_MW131D_210427,							
0958_MW132I_210427,	0958_MW130D_210427,							
0958_MW128S_210427,	0958_MW126I_210427,							
0958_MW125S_210427,	0958_MW129I_210427,							
0958_QC103_210427,	0958_MW106S_210427							



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis											
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation									
EP231P: PFAS Sums																	
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔									
0958_MW140D_210427,																	
0958_MW138S_210427,																	
0958_MW135I_210427,																	
0958_MW133D_210427,																	
0958_MW132I_210427,																	
0958_MW128S_210427,																	
0958_MW125S_210427,																	
0958_QC103_210427,		0958_MW139I_210427,		0958_QC102_210427,		0958_MW136D_210427,		0958_MW131D_210427,		0958_MW130D_210427,		0958_MW126I_210427,		0958_MW129I_210427,		0958_MW106S_210427	



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	35	2.86	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2104577**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: [REDACTED]@cardno.com.au	E-mail	: [REDACTED]@alsglobal.com
Telephone	: ----	Telephone	: [REDACTED]
Facsimile	: ----	Facsimile	: [REDACTED]
Project	: WA_0958_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/330	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 22030	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Gingin		
Sampler	: [REDACTED] [REDACTED]		

Dates

Date Samples Received	: 27-Apr-2021 16:40	Issue Date	: 28-Apr-2021
Client Requested Due Date	: 07-May-2021	Scheduled Reporting Date	: 07-May-2021

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 1.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 16 / 16

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2104577-001	27-Apr-2021 09:57	0958_MW140D_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-002	27-Apr-2021 10:09	0958_MW139I_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-003	27-Apr-2021 10:31	0958_MW138S_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-004	27-Apr-2021 10:32	0958_QC102_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-005	27-Apr-2021 11:41	0958_MW135I_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-006	27-Apr-2021 11:42	0958_MW136D_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-007	27-Apr-2021 12:43	0958_MW133D_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-008	27-Apr-2021 12:44	0958_MW131D_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-009	27-Apr-2021 12:57	0958_MW132I_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-010	27-Apr-2021 13:26	0958_MW130D_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-011	27-Apr-2021 14:13	0958_MW128S_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-012	27-Apr-2021 14:34	0958_MW126I_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-013	27-Apr-2021 14:52	0958_MW125S_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-014	27-Apr-2021 13:53	0958_MW129I_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-015	27-Apr-2021 13:55	0958_QC103_210427	✓	✓	✓	✓	✓	✓	✓
EP2104577-016	27-Apr-2021 15:17	0958_MW106S_210427	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2104577-001	27-Apr-2021 09:57	0958_MW140D_210427	✓
EP2104577-002	27-Apr-2021 10:09	0958_MW139I_210427	✓
EP2104577-003	27-Apr-2021 10:31	0958_MW138S_210427	✓
EP2104577-004	27-Apr-2021 10:32	0958_QC102_210427	✓
EP2104577-005	27-Apr-2021 11:41	0958_MW135I_210427	✓
EP2104577-006	27-Apr-2021 11:42	0958_MW136D_210427	✓
EP2104577-007	27-Apr-2021 12:43	0958_MW133D_210427	✓
EP2104577-008	27-Apr-2021 12:44	0958_MW131D_210427	✓



				WATER - EP231X PFAS - Full Suite (28 analytes)
EP2104577-009	27-Apr-2021 12:57	0958_MW132I_210427	✓	
EP2104577-010	27-Apr-2021 13:26	0958_MW130D_210427	✓	
EP2104577-011	27-Apr-2021 14:13	0958_MW128S_210427	✓	
EP2104577-012	27-Apr-2021 14:34	0958_MW126I_210427	✓	
EP2104577-013	27-Apr-2021 14:52	0958_MW125S_210427	✓	
EP2104577-014	27-Apr-2021 13:53	0958_MW129I_210427	✓	
EP2104577-015	27-Apr-2021 13:55	0958_QC103_210427	✓	
EP2104577-016	27-Apr-2021 15:17	0958_MW106S_210427	✓	

Proactive Holding Time Report

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

Requested Deliverables

<ul style="list-style-type: none"> - A4 - AU Tax Invoice (INV) 	Email	
DERP LAB REPORTS		
<ul style="list-style-type: none"> - EDI Format - ESDAT (ESDAT) 	Email	
<ul style="list-style-type: none"> - *AU Certificate of Analysis - NATA (COA) 	Email	cardno.com.au
<ul style="list-style-type: none"> - *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) 	Email	cardno.com.au
<ul style="list-style-type: none"> - *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) 	Email	cardno.com.au
<ul style="list-style-type: none"> - A4 - AU Sample Receipt Notification - Environmental HT (SRN) 	Email	cardno.com.au
<ul style="list-style-type: none"> - Chain of Custody (CoC) (COC) 	Email	cardno.com.au
<ul style="list-style-type: none"> - EDI Format - ESDAT (ESDAT) 	Email	cardno.com.au
<ul style="list-style-type: none"> - EDI Format - XTab (XTAB) 	Email	cardno.com.au



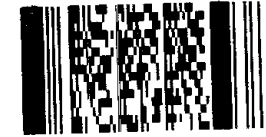
ALSCompass

SAMPLING *Intelligence*



Environmental Division
Perth

Work Order Reference
EP2104577



Telephone : -- 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: WA_0958_PFASOMP

Client: Cardno

Project Manager: [REDACTED]

Phone: [REDACTED]

ALS Compass COC Reference: 22030
22049

Samples:

Sampler: [REDACTED]

Phone: [REDACTED]

Turnaround Requirements: Standard

Special Instructions:

Please send GC201, GC202 ... to Eurofins.

Custody:

Relinquished by:

Received by:

Relinquished by:

Received by:

Date / Time:

Date / Time:

Date / Time:

Date / Time:

[REDACTED]
1640
27/4/21.

CLIENT: CARBSD - CARDNO (WA) PTY LTD
PROJECT: WA_0958_PFSOMP
SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER: [REDACTED]
PRIMARY SAMPLER: [REDACTED]

EMAIL REPORTS TO: [REDACTED]
EMAIL INVOICES TO: [REDACTED]

CONTACT PH: [REDACTED] **SAMPLER MOBILE:** [REDACTED]
QUOTE NO: SY/139/19 **/ ES2019CARBSD0002**

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

TURNAROUND REQUIREMENTS : 5 Days
Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:	°C		
Other comments:			

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW140D		27/04/2021 09:57 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0958_MW139I		27/04/2021 10:09 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0958_MW138S		27/04/2021 10:31 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0958_QC102		27/04/2021 10:32 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0958_MW135I		27/04/2021 11:41 AM	Water	ALS: 4 Non ALS: 0	No	X		
006	0958_MW136D		27/04/2021 11:42 AM	Water	ALS: 4 Non ALS: 0	No	X		
007	0958_MW133D		27/04/2021 12:43 PM	Water	ALS: 4 Non ALS: 0	No	X		
008	0958_MW131D		27/04/2021 12:44 PM	Water	ALS: 4 Non ALS: 0	No	X		
009	0958_MW132I		27/04/2021 12:57 PM	Water	ALS: 4 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 22030

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_MW130D		27/04/2021 01:26 PM	Water	ALS: 6 Non ALS: 0	No	X		
011	0958_MW128S		27/04/2021 02:13 PM	Water	ALS: 4 Non ALS: 0	No	X		
012	0958_MW126I		27/04/2021 02:34 PM	Water	ALS: 4 Non ALS: 0	No	X		
013	0958_MW125S		27/04/2021 02:52 PM	Water	ALS: 4 Non ALS: 0	No	X		
014	0958_MW129I		27/04/2021 01:53 PM	Water	ALS: 4 Non ALS: 0	No	X		
015	0958_QC103		27/04/2021 01:55 PM	Water	ALS: 4 Non ALS: 0	No	X		
016	0958_MW106S		27/04/2021 03:17 PM	Water	ALS: 4 Non ALS: 0	No	X		

CHAIN OF CUSTODY

ALS COC#: 22030 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW140D	Clear Plastic Bottle - Natural	250 mL	00071020084242	Green	No	
001	0958_MW140D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019003	Purple	No	
001	0958_MW140D	HDPE (no PTFE)	20 mL	00352010070573	Grey	No	
002	0958_MW139I	HDPE (no PTFE)	20 mL	00352010070708	Grey	No	
002	0958_MW139I	Clear Plastic Bottle - Natural	250 mL	00071020084259	Green	No	
002	0958_MW139I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018945	Purple	No	
002	0958_MW139I	HDPE (no PTFE)	20 mL	00352010070581	Grey	No	
003	0958_MW138S	HDPE (no PTFE)	20 mL	00352010070748	Grey	No	
003	0958_MW138S	Clear Plastic Bottle - Natural	250 mL	00071020084239	Green	No	
003	0958_MW138S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018981	Purple	No	
003	0958_MW138S	HDPE (no PTFE)	20 mL	00352010070576	Grey	No	
004	0958_QC102	HDPE (no PTFE)	20 mL	00352010070700	Grey	No	
004	0958_QC102	Clear Plastic Bottle - Natural	250 mL	00071020084197	Green	No	
004	0958_QC102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019025	Purple	No	
004	0958_QC102	HDPE (no PTFE)	20 mL	00352010070569	Grey	No	
005	0958_MW135I	HDPE (no PTFE)	20 mL	00352010070791	Grey	No	
005	0958_MW135I	Clear Plastic Bottle - Natural	250 mL	00071020084253	Green	No	
005	0958_MW135I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019002	Purple	No	
005	0958_MW135I	HDPE (no PTFE)	20 mL	00352010070705	Grey	No	
006	0958_MW136D	HDPE (no PTFE)	20 mL	00352010070633	Grey	No	
006	0958_MW136D	Clear Plastic Bottle - Natural	250 mL	00071020084223	Green	No	
006	0958_MW136D	HDPE (no PTFE)	20 mL	00352010070772	Grey	No	
006	0958_MW136D	HDPE (no PTFE)	20 mL	00352010070722	Grey	No	
007	0958_MW133D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018998	Purple	No	
007	0958_MW133D	Clear Plastic Bottle - Natural	250 mL	00071020084198	Green	No	
007	0958_MW133D	HDPE (no PTFE)	20 mL	00352010070724	Grey	No	

Tuesday, April 27, 2021

7:35:01 AM



CHAIN OF CUSTODY

COC#: 22030

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

007	0958_MW133D	HDPE (no PTFE)	20 mL	00352010070536	Grey	No	
007	0958_MW133D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019023	Purple	No	
008	0958_MW131D	Clear Plastic Bottle - Natural	250 mL	00071020084224	Green	No	
008	0958_MW131D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019010	Purple	No	
008	0958_MW131D	HDPE (no PTFE)	20 mL	00352010070689	Grey	No	
008	0958_MW131D	HDPE (no PTFE)	20 mL	00352010070699	Grey	No	
009	0958_MW132I	Clear Plastic Bottle - Natural	250 mL	00071020084123	Green	No	
009	0958_MW132I	HDPE (no PTFE)	20 mL	00352010070695	Grey	No	
009	0958_MW132I	HDPE (no PTFE)	20 mL	00352010070673	Grey	No	
009	0958_MW132I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019225	Purple	No	
010	0958_MW130D	Clear Plastic Bottle - Natural	250 mL	00071020084214	Green	No	
010	0958_MW130D	HDPE (no PTFE)	20 mL	00352010070624	Grey	No	
010	0958_MW130D	HDPE (no PTFE)	20 mL	00352010070782	Grey	No	
010	0958_MW130D	HDPE (no PTFE)	20 mL	00352010070780	Grey	No	
010	0958_MW130D	HDPE (no PTFE)	20 mL	00352010070585	Grey	No	
010	0958_MW130D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019011	Purple	No	
011	0958_MW128S	HDPE (no PTFE)	20 mL	00352010070608	Grey	No	
011	0958_MW128S	HDPE (no PTFE)	20 mL	00352010070638	Grey	No	
011	0958_MW128S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018765	Purple	No	
011	0958_MW128S	Clear Plastic Bottle - Natural	250 mL	00071020084142	Green	No	
012	0958_MW126I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018840	Purple	No	
012	0958_MW126I	HDPE (no PTFE)	20 mL	00350019152558	Grey	No	
012	0958_MW126I	Clear Plastic Bottle - Natural	250 mL	00071020084161	Green	No	
012	0958_MW126I	HDPE (no PTFE)	20 mL	00350019152553	Grey	No	
013	0958_MW125S	Clear Plastic Bottle - Natural	250 mL	00071020084104	Green	No	
013	0958_MW125S	HDPE (no PTFE)	20 mL	00352010070736	Grey	No	
013	0958_MW125S	HDPE (no PTFE)	20 mL	00352010070632	Grey	No	



CHAIN OF CUSTODY

COC#: 22030 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

013	0958_MW125S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019446	Purple	No	
014	0958_MW129I	Clear Plastic Bottle - Natural	250 mL	00071020084160	Green	No	
014	0958_MW129I	HDPE (no PTFE)	20 mL	00352010070647	Grey	No	
014	0958_MW129I	HDPE (no PTFE)	20 mL	00352010070568	Grey	No	
015	0958_QC103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019334	Purple	No	
015	0958_QC103	Clear Plastic Bottle - Natural	250 mL	00071020084203	Green	No	
015	0958_QC103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018972	Purple	No	
015	0958_QC103	HDPE (no PTFE)	20 mL	00352010070668	Grey	No	
016	0958_MW106S	Clear Plastic Bottle - Natural	250 mL	00071020084195	Green	No	
016	0958_MW106S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019068	Purple	No	
016	0958_MW106S	HDPE (no PTFE)	20 mL	00352010070770	Grey	No	
016	0958_MW106S	HDPE (no PTFE)	20 mL	00352010070666	Grey	No	

Total Bottle Count: ALS: 66, Non ALS: 0

CERTIFICATE OF ANALYSIS

Work Order : **EP2104578**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 22049
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 12
No. of samples analysed : 12

Page : 1 of 11
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 27-Apr-2021 16:40
Date Analysis Commenced : 29-Apr-2021
Issue Date : 10-May-2021 11:03



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high for sample #3 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW402_210427	0958_QC101_210427	0958_MW401_210427	0958_POT101_210427 7	0958_POT105_210427 7
Sampling date / time				27-Apr-2021 11:03	27-Apr-2021 11:05	27-Apr-2021 11:25	27-Apr-2021 11:42	27-Apr-2021 11:50
Compound	CAS Number	LOR	Unit	EP2104578-001	EP2104578-002	EP2104578-003	EP2104578-004	EP2104578-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.80	5.86	6.24	7.07	6.95
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	196	179	113	272	251
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	5	<5	68	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	6	7	15	26	29
Total Alkalinity as CaCO3	----	1	mg/L	6	7	15	26	29
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	<1	2	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	113	113	42	175	159
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1	1	<1	<1	<1
Magnesium	7439-95-4	1	mg/L	4	4	3	<1	<1
Sodium	7440-23-5	1	mg/L	65	65	26	108	100
Potassium	7440-09-7	1	mg/L	2	2	1	<1	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.31	3.33	1.48	5.50	5.06
∅ Total Cations	----	0.01	meq/L	3.26	3.26	1.40	4.70	4.35
∅ Ionic Balance	----	0.01	%	0.76	1.06	2.81	7.85	7.59
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	6	5	4	5
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.06	<0.02	0.08	0.08
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	0.07	<0.02	0.08	0.09
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.54	0.54	<0.02	0.57	0.64
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.04	<0.02	0.04	0.04



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW402_210427	0958_QC101_210427	0958_MW401_210427	0958_POT101_210427 7	0958_POT105_210427 7
Sampling date / time				27-Apr-2021 11:03	27-Apr-2021 11:05	27-Apr-2021 11:25	27-Apr-2021 11:42	27-Apr-2021 11:50
Compound	CAS Number	LOR	Unit	EP2104578-001	EP2104578-002	EP2104578-003	EP2104578-004	EP2104578-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.26	0.27	<0.01	0.24	0.25
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	0.03	0.03
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.11	0.12	<0.02	0.16	0.16
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.02	0.03	<0.01	0.03	0.03
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW402_210427	0958_QC101_210427	0958_MW401_210427	0958_POT101_210427 7	0958_POT105_210427 7
Sampling date / time				27-Apr-2021 11:03	27-Apr-2021 11:05	27-Apr-2021 11:25	27-Apr-2021 11:42	27-Apr-2021 11:50
Compound	CAS Number	LOR	Unit	EP2104578-001	EP2104578-002	EP2104578-003	EP2104578-004	EP2104578-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.10	1.13	<0.01	1.23	1.32
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.80	0.81	<0.01	0.81	0.89
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.99	1.02	<0.01	1.11	1.19
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	82.1	81.6	83.0	80.9	81.1
13C8-PFOA	----	0.02	%	93.8	94.8	94.0	96.5	95.8



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_POT104_21042 7	0958_POT103_21042 7	0958_POT102_21042 7	----	----
Sampling date / time				27-Apr-2021 12:02	27-Apr-2021 12:14	27-Apr-2021 12:30	----	----
Compound	CAS Number	LOR	Unit	EP2104578-006	EP2104578-007	EP2104578-008	-----	-----
Result				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.72	7.26	7.09	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	356	295	262	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	16	48	25	----	----
Total Alkalinity as CaCO3	----	1	mg/L	16	48	25	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	2	2	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	239	171	159	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	3	<1	----	----
Magnesium	7439-95-4	1	mg/L	<1	<1	<1	----	----
Sodium	7440-23-5	1	mg/L	138	114	103	----	----
Potassium	7440-09-7	1	mg/L	<1	<1	<1	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	7.10	5.82	5.03	----	----
∅ Total Cations	----	0.01	meq/L	6.00	5.11	4.48	----	----
∅ Ionic Balance	----	0.01	%	8.40	6.55	5.74	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	3	4	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.09	0.06	0.08	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.09	0.06	0.08	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.68	0.43	0.61	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.03	0.04	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_POT104_21042 7	0958_POT103_21042 7	0958_POT102_21042 7	----	----
Sampling date / time				27-Apr-2021 12:02	27-Apr-2021 12:14	27-Apr-2021 12:30	----	----
Compound	CAS Number	LOR	Unit	EP2104578-006	EP2104578-007	EP2104578-008	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.28	0.18	0.27	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.02	0.03	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.17	0.11	0.16	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	0.02	0.03	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_POT104_21042 7	0958_POT103_21042 7	0958_POT102_21042 7	----	----
Sampling date / time				27-Apr-2021 12:02	27-Apr-2021 12:14	27-Apr-2021 12:30	----	----
Compound	CAS Number	LOR	Unit	EP2104578-006	EP2104578-007	EP2104578-008	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.41	0.91	1.30	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.96	0.61	0.88	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.28	0.82	1.18	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	86.0	77.5	81.7	----	----
13C8-PFOA	----	0.02	%	92.9	95.7	97.1	----	----



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

				0958_QC301_210427	0958_QC401_210427	0958_QC302_210427	0958_QC402_210427	----
Sampling date / time				27-Apr-2021 12:43	27-Apr-2021 12:44	27-Apr-2021 12:46	27-Apr-2021 12:47	----
Compound	CAS Number	LOR	Unit	EP2104578-009	EP2104578-010	EP2104578-011	EP2104578-012	-----
				Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

				0958_QC301_210427	0958_QC401_210427	0958_QC302_210427	0958_QC402_210427	----
Sampling date / time				27-Apr-2021 12:43	27-Apr-2021 12:44	27-Apr-2021 12:46	27-Apr-2021 12:47	----
Compound	CAS Number	LOR	Unit	EP2104578-009	EP2104578-010	EP2104578-011	EP2104578-012	-----
				Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	81.7	80.6	82.5	81.2	----
13C8-PFOA	----	0.02	%	94.8	93.3	99.5	98.6	----



Surrogate Control Limits

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

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

- (WATER) EP231A: Perfluoroalkyl Sulfonic Acids
- (WATER) EP231B: Perfluoroalkyl Carboxylic Acids
- (WATER) EP231C: Perfluoroalkyl Sulfonamides
- (WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids
- (WATER) EP231P: PFAS Sums
- (WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2104578	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 27-Apr-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 29-Apr-2021
C-O-C number	: 22049	Issue Date	: 10-May-2021
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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

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

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

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

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3662151)									
EP2104578-002	0958_QC101_210427	EA005-P: pH Value	----	0.01	pH Unit	5.86	5.86	0.00	0% - 20%
EP2104616-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.98	6.98	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3656507)									
EP2104577-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	212	219	3.25	0% - 20%
EP2104577-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	97	80	19.5	No Limit
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3656531)									
EP2104539-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	561	568	1.15	0% - 20%
EP2104578-007	0958_POT103_210427	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	295	282	4.33	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3656508)									
EP2104577-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	12	14	11.5	No Limit
EP2104577-011	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	134	137	2.40	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3656532)									
EP2104539-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.00	No Limit
EP2104627-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	54	44	20.0	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3662150)									
EP2104578-002	0958_QC101_210427	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	7	7	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	7	7	0.00	No Limit
EP2104616-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	8	8	0.00	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	8	8	0.00	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3647702)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3647702) - continued									
EP2104541-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	99	98	1.02	0% - 20%
EP2104578-008	0958_POT102_210427	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	2	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3647703)									
EP2104541-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	361	361	0.00	0% - 20%
EP2104578-008	0958_POT102_210427	ED045G: Chloride	16887-00-6	1	mg/L	159	159	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3647211)									
EP2104577-016	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	2	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	5	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	21	22	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.00	No Limit
EP2104632-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	137	143	4.33	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	52	53	2.55	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	400	405	1.33	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	12	12	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3650557)									
EP2104577-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	4	0.00	No Limit
EP2104577-011	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	10	10	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3653047)									
EP2104578-005	0958_POT105_210427	EP002: Dissolved Organic Carbon	----	1	mg/L	5	5	0.00	No Limit
EP2104665-013	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	15	15	0.00	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3663620)									
EP2104578-005	0958_POT105_210427	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.25	0.21	16.3	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.08	0.07	15.5	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.09	0.07	14.3	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.64	0.54	16.9	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2104578-009	0958_QC301_210427	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3663620)									
EP2104578-005	0958_POT105_210427	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.16	0.14	11.2	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3663620) - continued									
EP2104578-005	0958_POT105_210427	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP2104578-009	0958_QC301_210427	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3663620)									
EP2104578-005	0958_POT105_210427	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2104578-009	0958_QC301_210427	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

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 Work Order : EP2104578
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3663620) - continued									
EP2104578-009	0958_QC301_210427	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3663620)									
EP2104578-005	0958_POT105_210427	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2104578-009	0958_QC301_210427	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3663620)									
EP2104578-005	0958_POT105_210427	EP231X: Sum of PFAS	----	0.01	µg/L	1.32	1.12	16.4	0% - 20%
EP2104578-009	0958_QC301_210427	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

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

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report				
	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)		
		LCS	Low	High	
----	4 pH Unit	101	98.5	102	
----	7 pH Unit	100	98.5	102	
<10	246 mg/L	90.0	88.1	114	
<10	1000 mg/L	100	88.1	114	
<10	246 mg/L	95.4	88.1	114	
<10	1000 mg/L	97.6	88.1	114	
<5	95 mg/L	89.5	89.1	120	
<5	1000 mg/L	102	89.1	120	
<5	95 mg/L	90.5	89.1	120	
<5	1000 mg/L	101	89.1	120	
<1	----	----	----	----	
<1	----	----	----	----	
<1	----	----	----	----	
<1	20 mg/L	102	81.2	126	
<1	200 mg/L	96.5	90.0	110	
<1	25 mg/L	102	87.7	113	
<1	500 mg/L	97.2	87.7	113	
<1	10 mg/L	98.2	87.9	114	
<1	1000 mg/L	101	87.9	114	
<1	50 mg/L	105	85.9	113	
<1	50 mg/L	100	88.0	110	
<1	50 mg/L	108	87.3	118	
<1	50 mg/L	97.0	89.7	108	



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3650557) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	99.2	73.2	116
				<1	100 mg/L	97.7	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653047)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	102	73.2	116
				<1	100 mg/L	101	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3663620)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	121	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	119	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	127	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3663620)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	117	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	115	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	122	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	130	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	120	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	128	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3663620)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	119	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	122	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	110	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	101	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	114	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	125	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3663620)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	119	63.0	143



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			LCS	Low
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3663620) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	121	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	107	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	107	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3647702)							
EP2104541-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	94.2	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3647703)							
EP2104541-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	87.4	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3650557)							
EP2104577-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	101	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653047)							
EP2104578-006	0958_POT104_210427	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3663620)							
EP2104578-007	0958_POT103_210427	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	105	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	85.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	116	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	103	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	72.2	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3663620)							
EP2104578-007	0958_POT103_210427	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	118	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	121	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	120	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	109	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	109	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	110	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	119	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	121	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	120	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	118	65.0	144



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3663620) - continued							
EP2104578-007	0958_POT103_210427	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	126	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3663620)							
EP2104578-007	0958_POT103_210427	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	111	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	118	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	109	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	102	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	117	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	122	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	120	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3663620)							
EP2104578-007	0958_POT103_210427	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	107	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	119	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	124	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	111	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2104578	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 27-Apr-2021
Site	: DEF19009/Gingin	Issue Date	: 10-May-2021
Sampler	: [REDACTED]	No. of samples received	: 12
Order number	: DEF19009/330	No. of samples analysed	: 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW402_210427,	0958_QC101_210427,	----	----	----	06-May-2021	27-Apr-2021	9
0958_MW401_210427,	0958_POT101_210427,						
0958_POT105_210427,	0958_POT104_210427,						
0958_POT103_210427,	0958_POT102_210427						

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)	27-Apr-2021	----	----	----	06-May-2021	27-Apr-2021	✘	
0958_MW402_210427,								0958_QC101_210427,
0958_MW401_210427,								0958_POT101_210427,
0958_POT105_210427,								0958_POT104_210427,
0958_POT103_210427,								0958_POT102_210427
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)	27-Apr-2021	----	----	----	04-May-2021	04-May-2021	✔	
0958_MW402_210427,								0958_QC101_210427,
0958_MW401_210427,								0958_POT101_210427,
0958_POT105_210427,								0958_POT104_210427,
0958_POT103_210427,								0958_POT102_210427
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)	27-Apr-2021	----	----	----	04-May-2021	04-May-2021	✔	
0958_MW402_210427,								0958_QC101_210427,
0958_MW401_210427,								0958_POT101_210427,
0958_POT105_210427,								0958_POT104_210427,
0958_POT103_210427,								0958_POT102_210427



Matrix: **WATER**

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

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0958_MW402_210427,	0958_QC101_210427,	27-Apr-2021	----	----	----	06-May-2021	11-May-2021	✓
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0958_MW402_210427,	0958_QC101_210427,	27-Apr-2021	----	----	----	03-May-2021	25-May-2021	✓
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0958_MW402_210427,	0958_QC101_210427,	27-Apr-2021	----	----	----	03-May-2021	25-May-2021	✓
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0958_MW402_210427,	0958_QC101_210427,	27-Apr-2021	----	----	----	30-Apr-2021	04-May-2021	✓
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0958_MW402_210427,	0958_QC101_210427,	27-Apr-2021	----	----	----	29-Apr-2021	25-May-2021	✓
0958_MW401_210427,	0958_POT101_210427							
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0958_POT105_210427,	0958_POT104_210427,	27-Apr-2021	----	----	----	30-Apr-2021	25-May-2021	✓
0958_POT103_210427,	0958_POT102_210427							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0958_MW402_210427,	0958_QC101_210427,	27-Apr-2021	07-May-2021	24-Oct-2021	✓	07-May-2021	24-Oct-2021	✓
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427,							
0958_QC301_210427,	0958_QC401_210427,							
0958_QC302_210427,	0958_QC402_210427							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW402_210427,	0958_QC101_210427,							
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427,							
0958_QC301_210427,	0958_QC401_210427,							
0958_QC302_210427,	0958_QC402_210427							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW402_210427,	0958_QC101_210427,							
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427,							
0958_QC301_210427,	0958_QC401_210427,							
0958_QC302_210427,	0958_QC402_210427							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW402_210427,	0958_QC101_210427,							
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427,							
0958_QC301_210427,	0958_QC401_210427,							
0958_QC302_210427,	0958_QC402_210427							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		27-Apr-2021	07-May-2021	24-Oct-2021	✔	07-May-2021	24-Oct-2021	✔
0958_MW402_210427,	0958_QC101_210427,							
0958_MW401_210427,	0958_POT101_210427,							
0958_POT105_210427,	0958_POT104_210427,							
0958_POT103_210427,	0958_POT102_210427,							
0958_QC301_210427,	0958_QC401_210427,							
0958_QC302_210427,	0958_QC402_210427							



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	37	10.81	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	37	10.81	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	37	5.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2104578**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: [REDACTED]@cardno.com.au	E-mail	: [REDACTED]@alsglobal.com
Telephone	: ----	Telephone	: [REDACTED]
Facsimile	: ----	Facsimile	: [REDACTED]
Project	: WA_0958_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/330	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 22049	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Gingin		
Sampler	: [REDACTED]		

Dates

Date Samples Received	: 27-Apr-2021 16:40	Issue Date	: 28-Apr-2021
Client Requested Due Date	: 07-May-2021	Scheduled Reporting Date	: 07-May-2021

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 2	Temperature	: 1.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 12 / 12

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2104578-001	27-Apr-2021 11:03	0958_MW402_210427	✓	✓	✓	✓	✓	✓	✓
EP2104578-002	27-Apr-2021 11:05	0958_QC101_210427	✓	✓	✓	✓	✓	✓	✓
EP2104578-003	27-Apr-2021 11:25	0958_MW401_210427	✓	✓	✓	✓	✓	✓	✓
EP2104578-004	27-Apr-2021 11:42	0958_POT101_210427	✓	✓	✓	✓	✓	✓	✓
EP2104578-005	27-Apr-2021 11:50	0958_POT105_210427	✓	✓	✓	✓	✓	✓	✓
EP2104578-006	27-Apr-2021 12:02	0958_POT104_210427	✓	✓	✓	✓	✓	✓	✓
EP2104578-007	27-Apr-2021 12:14	0958_POT103_210427	✓	✓	✓	✓	✓	✓	✓
EP2104578-008	27-Apr-2021 12:30	0958_POT102_210427	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2104578-001	27-Apr-2021 11:03	0958_MW402_210427	✓
EP2104578-002	27-Apr-2021 11:05	0958_QC101_210427	✓
EP2104578-003	27-Apr-2021 11:25	0958_MW401_210427	✓
EP2104578-004	27-Apr-2021 11:42	0958_POT101_210427	✓
EP2104578-005	27-Apr-2021 11:50	0958_POT105_210427	✓
EP2104578-006	27-Apr-2021 12:02	0958_POT104_210427	✓
EP2104578-007	27-Apr-2021 12:14	0958_POT103_210427	✓
EP2104578-008	27-Apr-2021 12:30	0958_POT102_210427	✓
EP2104578-009	27-Apr-2021 12:43	0958_QC301_210427	✓
EP2104578-010	27-Apr-2021 12:44	0958_QC401_210427	✓
EP2104578-011	27-Apr-2021 12:46	0958_QC302_210427	✓
EP2104578-012	27-Apr-2021 12:47	0958_QC402_210427	✓

Proactive Holding Time Report

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

████████████████████

- Email [REDACTED]

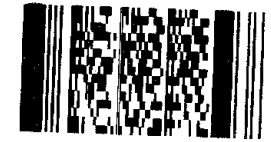
- EDI Format - ESDAT (ESDAT)

- Email
- [REDACTED]

- [illegible]



Environmental Division
Perth
Work Order Reference
EP2104578



Telephone : -- 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: WA_0958_PFA5OMP Client: Cardno Project Manager: [REDACTED]
ALS Compass COC Reference: 22030 # Samples: Sampler: [REDACTED]
22049 Phone: [REDACTED]

Turnaround Requirements: Standard

Special Instructions:

Please send GC201, GC202 ... to Eurofins.

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
Date / Time:	Date / Time:	Date / Time:	Date / Time:
	<u>1640</u> <u>27/4/21</u>		

**CHAIN OF CUSTODY**

COC#: 22049

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED			
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW402		27/04/2021 11:03 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_QC101		27/04/2021 11:05 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0958_MW401		27/04/2021 11:25 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_POT101		27/04/2021 11:42 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_POT105		27/04/2021 11:50 AM	Water	ALS: 6 Non ALS: 0	No	X			
006	0958_POT104		27/04/2021 12:02 PM	Water	ALS: 4 Non ALS: 0	No	X			
007	0958_POT103		27/04/2021 12:14 PM	Water	ALS: 6 Non ALS: 0	No	X			
008	0958_POT102		27/04/2021 12:30 PM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_QC301		27/04/2021 12:43 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

COC#: 22049

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_QC401		27/04/2021 12:44 PM	Water	ALS: 2 Non ALS: 0	No		X		
011	0958_QC302		27/04/2021 12:46 PM	Water	ALS: 2 Non ALS: 0	No		X		
012	0958_QC402		27/04/2021 12:47 PM	Water	ALS: 2 Non ALS: 0	No		X		



ALS Laboratory: EP Perth

RECEIVED BY:

DATE TIME:

EMAIL INVOICES TO:

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

 $\cdot^{\circ}\text{C}$

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW402	Clear Plastic Bottle - Natural	250 mL	00071020085263	Green	No	
001	0958_MW402	HDPE (no PTFE)	20 mL	00350019152336	Grey	No	
001	0958_MW402	HDPE (no PTFE)	20 mL	00350019152419	Grey	No	
001	0958_MW402	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019472	Purple	No	
002	0958_QC101	Clear Plastic Bottle - Natural	250 mL	00071020181238	Green	No	
002	0958_QC101	HDPE (no PTFE)	20 mL	00352010070579	Grey	No	
002	0958_QC101	HDPE (no PTFE)	20 mL	00352010070558	Grey	No	
002	0958_QC101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018996	Purple	No	
003	0958_MW401	Clear Plastic Bottle - Natural	250 mL	00071020085284	Green	No	
003	0958_MW401	HDPE (no PTFE)	20 mL	00350019152344	Grey	No	
003	0958_MW401	HDPE (no PTFE)	20 mL	00350019152517	Grey	No	
003	0958_MW401	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018971	Purple	No	
004	0958_POT101	Clear Plastic Bottle - Natural	250 mL	00071020024066	Green	No	
004	0958_POT101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018856	Purple	No	
004	0958_POT101	HDPE (no PTFE)	20 mL	00352010070613	Grey	No	
004	0958_POT101	HDPE (no PTFE)	20 mL	00352010070786	Grey	No	
005	0958_POT105	Clear Plastic Bottle - Natural	250 mL	00071020181198	Green	No	
005	0958_POT105	HDPE (no PTFE)	20 mL	00352005005298	Grey	No	
005	0958_POT105	HDPE (no PTFE)	20 mL	00352005005326	Grey	No	
005	0958_POT105	HDPE (no PTFE)	20 mL	00350019152298	Grey	No	
005	0958_POT105	HDPE (no PTFE)	20 mL	00350019152434	Grey	No	
005	0958_POT105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019239	Purple	No	
006	0958_POT104	HDPE (no PTFE)	20 mL	00350019152458	Grey	No	
006	0958_POT104	HDPE (no PTFE)	20 mL	00350019152487	Grey	No	
006	0958_POT104	Clear Plastic Bottle - Natural	250 mL	00071020181174	Green	No	
006	0958_POT104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018815	Purple	No	

**CHAIN OF CUSTODY**

COC#: 22049

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

007	0958_POT103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019383	Purple	No	
007	0958_POT103	Clear Plastic Bottle - Natural	250 mL	00071020181193	Green	No	
007	0958_POT103	HDPE (no PTFE)	20 mL	00352005006484	Grey	No	
007	0958_POT103	HDPE (no PTFE)	20 mL	00352005006439	Grey	No	
007	0958_POT103	HDPE (no PTFE)	20 mL	00350019152295	Grey	No	
007	0958_POT103	HDPE (no PTFE)	20 mL	00350019152499	Grey	No	
008	0958_POT102	Clear Plastic Bottle - Natural	250 mL	00071020181234	Green	No	
008	0958_POT102	HDPE (no PTFE)	20 mL	00350019152285	Grey	No	
008	0958_POT102	HDPE (no PTFE)	20 mL	00350019152387	Grey	No	
008	0958_POT102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018820	Purple	No	
009	0958_QC301	HDPE (no PTFE)	20 mL	00352010070694	Grey	No	
009	0958_QC301	HDPE (no PTFE)	20 mL	00352010070629	Grey	No	
010	0958_QC401	HDPE (no PTFE)	20 mL	00350019152283	Grey	No	
010	0958_QC401	HDPE (no PTFE)	20 mL	00350019152270	Grey	No	
011	0958_QC302	HDPE (no PTFE)	20 mL	00352010070554	Grey	No	
011	0958_QC302	HDPE (no PTFE)	20 mL	00352010070521	Grey	No	
012	0958_QC402	HDPE (no PTFE)	20 mL	00350019152331	Grey	No	
012	0958_QC402	HDPE (no PTFE)	20 mL	00350019152303	Grey	No	

Total Bottle Count: ALS: 44, Non ALS: 0

CERTIFICATE OF ANALYSIS

Work Order : **EP2104665**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 22106
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 16
No. of samples analysed : 16

Page : 1 of 13
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 28-Apr-2021 16:20
Date Analysis Commenced : 30-Apr-2021
Issue Date : 11-May-2021 21:48



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X: Poor Matrix spike recovery due to matrix interference.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- ED041G (Turbidimetric Sulphate) LOR for samples EP2104665-014 and 015 raised due to possible sample matrix interference.
- EA005: pH for sample #9 and 10 confirmed by re-preparation and re-analysis.
- ED037: Total Alkalinity for sample #9 and 10 confirmed by re-preparation and re-analysis.
- EA025: Total Suspended Solids for sample #9 and 10 confirmed by re-preparation and re-analysis.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits for sample #10, 12, 13, 14, 15 and 16 due to analytes not quantified in this report.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW504_210428	0958_MW105D_210428	0958_MW104I_210428	0958_QC105_210428	0958_MW310_210428
Sampling date / time				28-Apr-2021 09:43	28-Apr-2021 10:10	28-Apr-2021 10:34	28-Apr-2021 10:36	28-Apr-2021 11:29
Compound	CAS Number	LOR	Unit	EP2104665-007	EP2104665-008	EP2104665-009	EP2104665-010	EP2104665-011
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.33	9.79	6.67	6.29	7.26
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	93	128	98	99	142
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	86	88	66	34	1040
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	17	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	7	9	20	16	70
Total Alkalinity as CaCO3	----	1	mg/L	7	26	20	16	70
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	15	10	3	<1	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	13	44	19	20	14
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	5	24	5	3	29
Magnesium	7439-95-4	1	mg/L	3	<1	1	1	<1
Sodium	7440-23-5	1	mg/L	9	21	18	19	11
Potassium	7440-09-7	1	mg/L	1	2	2	1	2
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	0.82	1.97	1.00	0.88	1.79
∅ Total Cations	----	0.01	meq/L	0.91	2.16	1.16	1.08	1.98
∅ Ionic Balance	----	0.01	%	5.46	4.68	7.76	10.2	4.86
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	13	7	26	26	15
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.12	0.07	0.04	0.04	0.05
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.34	0.13	0.03	0.03	0.10
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	2.86	1.33	0.26	0.25	0.92
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.33	0.07	<0.02	<0.02	0.09



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW504_210428	0958_MW105D_210428 8	0958_MW104I_210428 8	0958_QC105_210428	0958_MW310_210428
Sampling date / time				28-Apr-2021 09:43	28-Apr-2021 10:10	28-Apr-2021 10:34	28-Apr-2021 10:36	28-Apr-2021 11:29
Compound	CAS Number	LOR	Unit	EP2104665-007	EP2104665-008	EP2104665-009	EP2104665-010	EP2104665-011
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	4.04	1.13	0.13	0.11	3.06
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.10	0.03	<0.02	<0.02	0.05
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.59	0.19	0.05	0.04	0.15
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.07	0.03	<0.02	<0.02	0.11
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.25	0.08	0.01	0.01	0.12
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.10
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.10
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.08
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.06
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW504_210428	0958_MW105D_210428 8	0958_MW104I_210428 8	0958_QC105_210428	0958_MW310_210428
Sampling date / time				28-Apr-2021 09:43	28-Apr-2021 10:10	28-Apr-2021 10:34	28-Apr-2021 10:36	28-Apr-2021 11:29
Compound	CAS Number	LOR	Unit	EP2104665-007	EP2104665-008	EP2104665-009	EP2104665-010	EP2104665-011
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	0.08
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	8.70	3.06	0.52	0.48	5.07
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	6.90	2.46	0.39	0.36	3.98
Sum of PFAS (WA DER List)	----	0.01	µg/L	8.03	2.86	0.49	0.45	4.54
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	98.0	103	99.5	95.3	94.9
13C8-PFOA	----	0.02	%	104	110	110	108	106



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW307_210428	0958_QC107_210428	0958_MW313_210428	0958_MW312_210428	0958_MW137S_210428
Sampling date / time				28-Apr-2021 12:03	28-Apr-2021 12:05	28-Apr-2021 12:24	28-Apr-2021 12:51	28-Apr-2021 13:22
Compound	CAS Number	LOR	Unit	EP2104665-012	EP2104665-013	EP2104665-014	EP2104665-015	EP2104665-016
Result				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.03	4.87	6.40	6.65	4.86
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	114	122	160	126	240
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	714	720	36	14	367
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	8	21	<1
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	8	21	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	6	7	<5	<5	24
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	28	29	22	31	22
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	8	8	16	7	4
Magnesium	7439-95-4	1	mg/L	3	3	2	2	6
Sodium	7440-23-5	1	mg/L	15	16	13	25	14
Potassium	7440-09-7	1	mg/L	2	1	2	3	19
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	0.91	0.96	0.78	1.29	1.12
∅ Total Cations	----	0.01	meq/L	1.35	1.37	1.58	1.68	1.79
∅ Ionic Balance	----	0.01	%	19.2	17.3	33.9	12.9	23.0
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	14	15	22	24	34
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.76	0.64	<0.02	0.08	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.80	0.87	0.03	0.10	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	5.54	4.65	0.40	0.87	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.42	0.44	0.03	0.06	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0958_MW307_210428	0958_QC107_210428	0958_MW313_210428	0958_MW312_210428	0958_MW137S_210428 8
Sampling date / time				28-Apr-2021 12:03	28-Apr-2021 12:05	28-Apr-2021 12:24	28-Apr-2021 12:51	28-Apr-2021 13:22	
Compound	CAS Number	LOR	Unit	EP2104665-012	EP2104665-013	EP2104665-014	EP2104665-015	EP2104665-016	
				Result	Result	Result	Result	Result	
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	11.0	10.5	0.47	2.38	<0.01	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.3	0.2	<0.1	<0.1	<0.1	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.59	0.53	<0.02	0.04	<0.02	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	2.21	1.81	0.09	0.19	<0.02	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.37	0.33	<0.02	0.03	<0.02	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.41	0.38	0.02	0.05	<0.01	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW307_210428	0958_QC107_210428	0958_MW313_210428	0958_MW312_210428	0958_MW137S_210428
								8
Sampling date / time				28-Apr-2021 12:03	28-Apr-2021 12:05	28-Apr-2021 12:24	28-Apr-2021 12:51	28-Apr-2021 13:22
Compound	CAS Number	LOR	Unit	EP2104665-012	EP2104665-013	EP2104665-014	EP2104665-015	EP2104665-016
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.10	0.09	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	22.5	20.4	1.04	3.80	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	16.5	15.2	0.87	3.25	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	21.3	19.1	0.98	3.64	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	92.6	93.3	91.5	87.5	94.1
13C8-PFOA	----	0.02	%	93.6	108	105	106	107



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

Sub-Matrix: RINSATE (Matrix: WATER)				Sample ID	0958_QC301_210428	0958_QC401_210428	0958_QC302_210428	0958_QC402_210428	0958_QC303_210428
Sampling date / time					28-Apr-2021 09:02	28-Apr-2021 09:03	28-Apr-2021 09:04	28-Apr-2021 09:04	28-Apr-2021 09:05
Compound	CAS Number	LOR	Unit	EP2104665-001	EP2104665-002	EP2104665-003	EP2104665-004	EP2104665-005	
				Result	Result	Result	Result	Result	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

				0958_QC301_210428	0958_QC401_210428	0958_QC302_210428	0958_QC402_210428	0958_QC303_210428
Sampling date / time				28-Apr-2021 09:02	28-Apr-2021 09:03	28-Apr-2021 09:04	28-Apr-2021 09:04	28-Apr-2021 09:05
Compound	CAS Number	LOR	Unit	EP2104665-001	EP2104665-002	EP2104665-003	EP2104665-004	EP2104665-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	93.0	89.9	97.9	95.1	88.7
13C8-PFOA	----	0.02	%	101	109	107	107	108



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

0958_QC403_210428

Sampling date / time				28-Apr-2021 09:06	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2104665-006	-----	-----	-----	-----
Result				----	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----



Analytical Results

Sub-Matrix: RINSATE
 (Matrix: WATER)

Sample ID

0958_QC403_210428

Sampling date / time				28-Apr-2021 09:06	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2104665-006	-----	-----	-----	-----
Result				----	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides - Continued

N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

EP231S: PFAS Surrogate

13C4-PFOS	----	0.02	%	96.3	----	----	----	----
13C8-PFOA	----	0.02	%	108	----	----	----	----



Surrogate Control Limits

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

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

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

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

QUALITY CONTROL REPORT

Work Order	: EP2104665	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Apr-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 30-Apr-2021
C-O-C number	: 22106	Issue Date	: 11-May-2021
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 16		
No. of samples analysed	: 16		



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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

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

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

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

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3665098)									
EP2104665-016	0958_MW137S_210428	EA005-P: pH Value	----	0.01	pH Unit	4.86	4.78	1.7	0% - 20%
EP2104610-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.20	8.17	0.4	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3659369)									
EP2104665-007	0958_MW504_210428	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	93	88	4.7	No Limit
EP2104665-015	0958_MW312_210428	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	126	130	3.1	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3659370)									
EP2104665-007	0958_MW504_210428	EA025H: Suspended Solids (SS)	----	5	mg/L	86	73	16.1	0% - 50%
EP2104666-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	79	80	2.2	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3665099)									
EP2104665-016	0958_MW137S_210428	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
EP2104610-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	349	350	0.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	349	350	0.3	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3650166)									
EP2104665-007	0958_MW504_210428	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	15	12	26.0	0% - 50%
EP2104666-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	40	39	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3650167)									
EP2104665-007	0958_MW504_210428	ED045G: Chloride	16887-00-6	1	mg/L	13	13	0.0	0% - 50%
EP2104666-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	31	31	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3651488)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED093F: Dissolved Major Cations (QC Lot: 3651488) - continued									
EP2104665-007	0958_MW504_210428	ED093F: Calcium	7440-70-2	1	mg/L	5	5	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	3	3	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	9	9	0.00	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
EP2104666-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	44	44	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	9	9	0.00	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3653047)									
EP2104578-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	5	5	0.00	No Limit
EP2104665-013	0958_QC107_210428	EP002: Dissolved Organic Carbon	----	1	mg/L	15	15	0.00	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3666435)									
EP2104665-008	0958_MW105D_210428	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.13	1.18	4.2	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.07	0.08	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.13	0.14	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.33	1.28	4.2	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.07	0.06	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3666435)									
EP2104665-008	0958_MW105D_210428	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.08	0.08	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.19	0.18	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3666435)									
EP2104665-008	0958_MW105D_210428	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Page : 4 of 7
 Work Order : EP2104665
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3666435) - continued									
EP2104665-008	0958_MW105D_210428	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3666435)									
EP2104665-008	0958_MW105D_210428	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3666435)									
EP2104665-008	0958_MW105D_210428	EP231X: Sum of PFAS	----	0.01	µg/L	3.06	3.06	0.0	0% - 20%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3665098)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3659369)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	98.9	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3659370)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	92.6	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3665099)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	108	81.2	126
				<1	200 mg/L	95.8	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650166)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.6	87.7	113
				<1	500 mg/L	97.5	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3650167)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	104	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3651488)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.6	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.2	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653047)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	102	73.2	116
				<1	100 mg/L	101	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666435)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	85.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	98.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	87.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666435) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	112	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666435)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	96.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	99.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	96.0	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	96.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	99.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	96.3	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666435)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	93.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	96.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	108	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	106	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	102	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	112	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666435)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	127	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	89.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	105	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	110	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650166)							
EP2104665-007	0958_MW504_210428	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	103	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3650167)							
EP2104665-007	0958_MW504_210428	ED045G: Chloride	16887-00-6	1000 mg/L	103	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653047)							
EP2104578-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666435)							
EP2104665-012	0958_MW307_210428	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	# Not Determined	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	# Not Determined	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666435)							
EP2104665-012	0958_MW307_210428	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	119	73.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	# 49.0	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	# 47.6	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	103	69.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	110	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	108	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	109	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666435)							
EP2104665-012	0958_MW307_210428	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	111	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	122	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	108	62.6	147
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	126	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	121	65.0	136
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666435)							
EP2104665-012	0958_MW307_210428	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	108	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	100	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	114	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2104665	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Apr-2021
Site	: DEF19009/Gingin	Issue Date	: 11-May-2021
Sampler	: [REDACTED]	No. of samples received	: 16
Order number	: DEF19009/330	No. of samples analysed	: 16

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2104665--012	0958_MW307_210428	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104665--012	0958_MW307_210428	Perfluorohexanoic acid (PFHxA)	307-24-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104665--012	0958_MW307_210428	Perfluoroheptanoic acid (PFHpA)	375-85-9	49.0 %	72.0-130%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104665--012	0958_MW307_210428	Perfluorooctanoic acid (PFOA)	335-67-1	47.6 %	71.0-133%	Recovery less than lower data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0958_MW504_210428, 0958_MW104I_210428, 0958_MW310_210428, 0958_QC107_210428, 0958_MW312_210428,	0958_MW105D_210428, 0958_QC105_210428, 0958_MW307_210428, 0958_MW313_210428, 0958_MW137S_210428	----	----	----	07-May-2021 28-Apr-2021	9

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0958_MW504_210428,	0958_MW105D_210428,	28-Apr-2021	----	----	----	07-May-2021	28-Apr-2021	✖
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0958_MW504_210428,	0958_MW105D_210428,	28-Apr-2021	----	----	----	05-May-2021	05-May-2021	✔
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0958_MW504_210428,	0958_MW105D_210428,	28-Apr-2021	----	----	----	05-May-2021	05-May-2021	✔
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0958_MW504_210428,	0958_MW105D_210428,	28-Apr-2021	----	----	----	07-May-2021	12-May-2021	✔
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0958_MW504_210428,	0958_MW105D_210428,	28-Apr-2021	----	----	----	10-May-2021	26-May-2021	✔
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0958_MW504_210428,	0958_MW105D_210428,	28-Apr-2021	----	----	----	10-May-2021	26-May-2021	✔
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							



Matrix: **WATER**

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

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0958_MW504_210428, 0958_MW104I_210428, 0958_MW310_210428, 0958_QC107_210428, 0958_MW312_210428,	0958_MW105D_210428, 0958_QC105_210428, 0958_MW307_210428, 0958_MW313_210428, 0958_MW137S_210428	28-Apr-2021	----	----	----	30-Apr-2021	05-May-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0958_MW504_210428, 0958_MW104I_210428, 0958_MW310_210428, 0958_QC107_210428, 0958_MW312_210428,	0958_MW105D_210428, 0958_QC105_210428, 0958_MW307_210428, 0958_MW313_210428, 0958_MW137S_210428	28-Apr-2021	----	----	----	30-Apr-2021	26-May-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0958_QC301_210428, 0958_QC302_210428, 0958_QC303_210428, 0958_MW504_210428, 0958_MW104I_210428, 0958_MW310_210428, 0958_QC107_210428, 0958_MW312_210428,	0958_QC401_210428, 0958_QC402_210428, 0958_QC403_210428, 0958_MW105D_210428, 0958_QC105_210428, 0958_MW307_210428, 0958_MW313_210428, 0958_MW137S_210428	28-Apr-2021	08-May-2021	25-Oct-2021	✓	08-May-2021	25-Oct-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0958_QC301_210428, 0958_QC302_210428, 0958_QC303_210428, 0958_MW504_210428, 0958_MW104I_210428, 0958_MW310_210428, 0958_QC107_210428, 0958_MW312_210428,	0958_QC401_210428, 0958_QC402_210428, 0958_QC403_210428, 0958_MW105D_210428, 0958_QC105_210428, 0958_MW307_210428, 0958_MW313_210428, 0958_MW137S_210428	28-Apr-2021	08-May-2021	25-Oct-2021	✓	08-May-2021	25-Oct-2021	✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✓	08-May-2021	25-Oct-2021	✓
0958_QC301_210428,	0958_QC401_210428,							
0958_QC302_210428,	0958_QC402_210428,							
0958_QC303_210428,	0958_QC403_210428,							
0958_MW504_210428,	0958_MW105D_210428,							
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✓	08-May-2021	25-Oct-2021	✓
0958_QC301_210428,	0958_QC401_210428,							
0958_QC302_210428,	0958_QC402_210428,							
0958_QC303_210428,	0958_QC403_210428,							
0958_MW504_210428,	0958_MW105D_210428,							
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✓	08-May-2021	25-Oct-2021	✓
0958_QC301_210428,	0958_QC401_210428,							
0958_QC302_210428,	0958_QC402_210428,							
0958_QC303_210428,	0958_QC403_210428,							
0958_MW504_210428,	0958_MW105D_210428,							
0958_MW104I_210428,	0958_QC105_210428,							
0958_MW310_210428,	0958_MW307_210428,							
0958_QC107_210428,	0958_MW313_210428,							
0958_MW312_210428,	0958_MW137S_210428							



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2104665

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: [REDACTED]@cardno.com.au	E-mail	: [REDACTED]@alsglobal.com
Telephone	: ----	Telephone	: [REDACTED]
Facsimile	: ----	Facsimile	: [REDACTED]
Project	: WA_0958_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/330	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 22106	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Gingin		
Sampler	: [REDACTED]		

Dates

Date Samples Received	: 28-Apr-2021 16:20	Issue Date	: 29-Apr-2021
Client Requested Due Date	: 10-May-2021	Scheduled Reporting Date	: 10-May-2021

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 6.8 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 16 / 16

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - EP231X PFAS - Full Suite (28 analytes)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2104665-001	28-Apr-2021 09:02	0958_QC301_210428					✓		
EP2104665-002	28-Apr-2021 09:03	0958_QC401_210428					✓		
EP2104665-003	28-Apr-2021 09:04	0958_QC302_210428					✓		
EP2104665-004	28-Apr-2021 09:04	0958_QC402_210428					✓		
EP2104665-005	28-Apr-2021 09:05	0958_QC303_210428					✓		
EP2104665-006	28-Apr-2021 09:06	0958_QC403_210428					✓		
EP2104665-007	28-Apr-2021 09:43	0958_MW504_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-008	28-Apr-2021 10:10	0958_MW105D_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-009	28-Apr-2021 10:34	0958_MW104I_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-010	28-Apr-2021 10:36	0958_QC105_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-011	28-Apr-2021 11:29	0958_MW310_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-012	28-Apr-2021 12:03	0958_MW307_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-013	28-Apr-2021 12:05	0958_QC107_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-014	28-Apr-2021 12:24	0958_MW313_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-015	28-Apr-2021 12:51	0958_MW312_210428	✓	✓	✓	✓	✓	✓	✓
EP2104665-016	28-Apr-2021 13:22	0958_MW137S_210428	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &
EP2104665-007	28-Apr-2021 09:43	0958_MW504_210428	✓
EP2104665-008	28-Apr-2021 10:10	0958_MW105D_210428	✓
EP2104665-009	28-Apr-2021 10:34	0958_MW104I_210428	✓
EP2104665-010	28-Apr-2021 10:36	0958_QC105_210428	✓
EP2104665-011	28-Apr-2021 11:29	0958_MW310_210428	✓
EP2104665-012	28-Apr-2021 12:03	0958_MW307_210428	✓
EP2104665-013	28-Apr-2021 12:05	0958_QC107_210428	✓
EP2104665-014	28-Apr-2021 12:24	0958_MW313_210428	✓



				WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &
EP2104665-015	28-Apr-2021 12:51	0958_MW312_210428	✓	
EP2104665-016	28-Apr-2021 13:22	0958_MW137S_210428	✓	

Proactive Holding Time Report

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

Requested Deliverables

<ul style="list-style-type: none"> - A4 - AU Tax Invoice (INV) 	Email	
DERP LAB REPORTS		
<ul style="list-style-type: none"> - EDI Format - ESDAT (ESDAT) 	Email	
<ul style="list-style-type: none"> - *AU Certificate of Analysis - NATA (COA) 	Email	cardno.com.au
<ul style="list-style-type: none"> - *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) 	Email	cardno.com.au
<ul style="list-style-type: none"> - *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) 	Email	cardno.com.au
<ul style="list-style-type: none"> - A4 - AU Sample Receipt Notification - Environmental HT (SRN) 	Email	cardno.com.au
<ul style="list-style-type: none"> - Chain of Custody (CoC) (COC) 	Email	cardno.com.au
<ul style="list-style-type: none"> - EDI Format - ESDAT (ESDAT) 	Email	cardno.com.au
<ul style="list-style-type: none"> - EDI Format - XTab (XTAB) 	Email	cardno.com.au



ALSCompass

SAMPLING *Intelligence*



Environmental Division
Perth

Work Order Reference
EP2104665



Telephone : - 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: WA_0958_PFASOMP Client: Cardno Project Manager: [REDACTED]
ALS Compass COC Reference: 22106 # Samples: 22111 Phone: [REDACTED]
22109 Sampler: [REDACTED]
Turnaround Requirements: Standard Phone: [REDACTED]

Special Instructions:

Please send QC 204 - 207 to Eurofins

Custody:

Relinquished by: <u>[REDACTED]</u> Date / Time: <u>28/04/21</u>	Received by: <u>[REDACTED]</u> Date / Time: <u>28/4/21</u> <u>1620</u>	Relinquished by:	Received by:
		Date / Time:	Date / Time:



CHAIN OF CUSTODY

COC#: 22106

ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes

No

N/A

Free ice / frozen ice bricks present upon receipt?

Yes

No

N/A

Random Sample Temperature on Receipt:

6.8

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_QC301		28/04/2021 09:02 AM	Water	ALS: 2 Non ALS: 0	No		X		
002	0958_QC401		28/04/2021 09:03 AM	Water	ALS: 2 Non ALS: 0	No		X		
003	0958_QC302		28/04/2021 09:04 AM	Water	ALS: 2 Non ALS: 0	No		X		
004	0958_QC402		28/04/2021 09:04 AM	Water	ALS: 2 Non ALS: 0	No		X		
005	0958_QC303		28/04/2021 09:05 AM	Water	ALS: 2 Non ALS: 0	No		X		
006	0958_QC403		28/04/2021 09:06 AM	Water	ALS: 2 Non ALS: 0	No		X		
007	0958_MW504		28/04/2021 09:43 AM	Water	ALS: 4 Non ALS: 0	No	X			
008	0958_MW105D		28/04/2021 10:10 AM	Water	ALS: 6 Non ALS: 0	No	X			
009	0958_MW104I		28/04/2021 10:34 AM	Water	ALS: 4 Non ALS: 0	No	X			



CHAIN OF CUSTODY

COC#: 22106 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes

No

N/A

Free ice / frozen ice bricks present upon receipt?

Yes

No

N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsale WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_QC105		28/04/2021 10:36 AM	Water	ALS: 4 Non ALS: 0	No	X			
011	0958_MW310		28/04/2021 11:29 AM	Water	ALS: 4 Non ALS: 0	No	X			
012	0958_MW307		28/04/2021 12:03 PM	Water	ALS: 6 Non ALS: 0	No	X			lab QC
013	0958_QC107		28/04/2021 12:05 PM	Water	ALS: 4 Non ALS: 0	No	X			
014	0958_MW313		28/04/2021 12:24 PM	Water	ALS: 4 Non ALS: 0	No	X			
015	0958_MW312		28/04/2021 12:51 PM	Water	ALS: 4 Non ALS: 0	No	X			
016	0958_MW137S		28/04/2021 01:22 PM	Water	ALS: 4 Non ALS: 0	No	X			



ALS Laboratory: EP Perth

RECEIVED BY:

DATE TIME:

EMAIL INVOICES TO:

Other comments:

3 of 4



CHAIN OF CUSTODY

COC#: 22106

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

010	0958_QC105	Clear Plastic Bottle - Natural	250 mL	00071020084256	Green	No	
010	0958_QC105	HDPE (no PTFE)	20 mL	00352010070730	Grey	No	
010	0958_QC105	HDPE (no PTFE)	20 mL	00352010070622	Grey	No	
010	0958_QC105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018156	Purple	No	
011	0958_MW310	Clear Plastic Bottle - Natural	250 mL	00071020084167	Green	No	
011	0958_MW310	HDPE (no PTFE)	20 mL	00352005006418	Grey	No	
011	0958_MW310	HDPE (no PTFE)	20 mL	00352005006368	Grey	No	
011	0958_MW310	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018823	Purple	No	
012	0958_MW307	Clear Plastic Bottle - Natural	250 mL	00071020084228	Green	No	
012	0958_MW307	HDPE (no PTFE)	20 mL	00350019164280	Grey	No	
012	0958_MW307	HDPE (no PTFE)	20 mL	00352005005042	Grey	No	
012	0958_MW307	HDPE (no PTFE)	20 mL	00352005005103	Grey	No	
012	0958_MW307	HDPE (no PTFE)	20 mL	00350019164439	Grey	No	
012	0958_MW307	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019000	Purple	No	
013	0958_QC107	Clear Plastic Bottle - Natural	250 mL	00071020084257	Green	No	
013	0958_QC107	HDPE (no PTFE)	20 mL	00352010070725	Grey	No	
013	0958_QC107	HDPE (no PTFE)	20 mL	00352010070682	Grey	No	
013	0958_QC107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018793	Purple	No	
014	0958_MW313	HDPE (no PTFE)	20 mL	00352010070649	Grey	No	
014	0958_MW313	HDPE (no PTFE)	20 mL	00352010070507	Grey	No	
014	0958_MW313	Clear Plastic Bottle - Natural	250 mL	00071020084212	Green	No	
014	0958_MW313	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019012	Purple	No	
015	0958_MW312	Clear Plastic Bottle - Natural	250 mL	00071020084233	Green	No	
015	0958_MW312	HDPE (no PTFE)	20 mL	00352010070553	Grey	No	
015	0958_MW312	HDPE (no PTFE)	20 mL	00352010070783	Grey	No	
015	0958_MW312	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018685	Purple	No	
016	0958_MW137S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018977	Purple	No	



CHAIN OF CUSTODY

COC#: 22106 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: MB_DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

016	0958_MW137S	Clear Plastic Bottle - Natural	250 mL	00071020084231	Green	No	
016	0958_MW137S	HDPE (no PTFE)	20 mL	00352010070580	Grey	No	
016	0958_MW137S	HDPE (no PTFE)	20 mL	00352010070660	Grey	No	

Total Bottle Count: ALS: 56, Non ALS: 0

CERTIFICATE OF ANALYSIS

Work Order : **EP2104666**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 22109
Sampler : [REDACTED] [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 12
No. of samples analysed : 12

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 28-Apr-2021 16:20
Date Analysis Commenced : 30-Apr-2021
Issue Date : 11-May-2021 13:07



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X: Poor Matrix spike recovery due to matrix interference.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- ED041G (Sulfate Turbidimetric): LOR for sample EP2104666-012 raised due to possible sample matrix interference.
- ED041G (Turbidimetric Sulphate): LOR raised for particular samples due to possible sample matrix interference.
- TDS by method EA-015 may bias high for sample #10, #11 and #12 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic Balance out of acceptable limits for sample #4, 5, 6, 7, 8, 10, 11 and 12 due to analytes not quantified in this report.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW102D_21042 8	0958_QC104_210428	0958_MW101I_21042 8	0958_MW302_210428	0958_MW303_210428
Sampling date / time				28-Apr-2021 09:58	28-Apr-2021 10:00	28-Apr-2021 10:22	28-Apr-2021 10:37	28-Apr-2021 10:47
Compound	CAS Number	LOR	Unit	EP2104666-001	EP2104666-002	EP2104666-003	EP2104666-004	EP2104666-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.65	7.63	6.45	4.02	4.12
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	234	211	78	124	97
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	79	72	16	409	115
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	51	48	10	<1	<1
Total Alkalinity as CaCO3	----	1	mg/L	51	48	10	<1	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	40	39	<1	<2	<2
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	31	31	18	17	21
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	44	45	<1	7	5
Magnesium	7439-95-4	1	mg/L	<1	<1	1	<1	<1
Sodium	7440-23-5	1	mg/L	9	9	15	10	11
Potassium	7440-09-7	1	mg/L	1	1	<1	<1	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	2.73	2.64	0.71	0.48	0.59
∅ Total Cations	----	0.01	meq/L	2.61	2.66	0.73	0.78	0.73
∅ Ionic Balance	----	0.01	%	2.13	0.32	1.89	24.1	10.3
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	14	16	21	19	20
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.13	0.14	<0.04	0.04	0.45
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.04	0.07	1.26
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.20	0.23	0.16	0.92	5.07
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	0.04	<0.04	0.10	2.15



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW102D_21042 8	0958_QC104_210428	0958_MW101I_21042 8	0958_MW302_210428	0958_MW303_210428
Sampling date / time				28-Apr-2021 09:58	28-Apr-2021 10:00	28-Apr-2021 10:22	28-Apr-2021 10:37	28-Apr-2021 10:47
Compound	CAS Number	LOR	Unit	EP2104666-001	EP2104666-002	EP2104666-003	EP2104666-004	EP2104666-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.28	0.31	0.09	0.59	77.7
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.2	<0.2	0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	0.34
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.02	0.02	<0.04	0.11	1.97
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	0.28
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	0.01	<0.04	0.10	1.16
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.10	<0.10	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.10	<0.10	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.10	<0.10	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.10	<0.10	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.10	<0.10	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW102D_21042 8	0958_QC104_210428	0958_MW101I_21042 8	0958_MW302_210428	0958_MW303_210428
Sampling date / time				28-Apr-2021 09:58	28-Apr-2021 10:00	28-Apr-2021 10:22	28-Apr-2021 10:37	28-Apr-2021 10:47
Compound	CAS Number	LOR	Unit	EP2104666-001	EP2104666-002	EP2104666-003	EP2104666-004	EP2104666-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.04	<0.04	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.67	0.75	0.25	1.93	90.5
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.48	0.54	0.25	1.51	82.8
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.64	0.71	0.25	1.76	87.1
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	93.2	95.9	62.0	81.8	89.3
13C8-PFOA	----	0.02	%	108	105	67.0	109	107



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW301_210428	0958_MW136_210428	0958_MW113S_210428	0958_MW109S_210428	0958_MW110S_210428
Sampling date / time				28-Apr-2021 10:57	28-Apr-2021 11:21	28-Apr-2021 11:35	28-Apr-2021 11:47	28-Apr-2021 12:08
Compound	CAS Number	LOR	Unit	EP2104666-006	EP2104666-007	EP2104666-008	EP2104666-009	EP2104666-010
Result				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	3.65	4.10	3.86	4.60	4.95
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	154	146	163	154	286
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	182	89	272	232	1580
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	<1	<1	<1
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	<1	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<2	<5	<5	22	6
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	23	20	23	19	22
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	10	5	8	3	3
Magnesium	7439-95-4	1	mg/L	2	1	1	4	3
Sodium	7440-23-5	1	mg/L	12	12	12	12	12
Potassium	7440-09-7	1	mg/L	<1	<1	<1	<1	1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	0.65	0.56	0.65	0.99	0.74
∅ Total Cations	----	0.01	meq/L	1.18	0.85	1.00	1.00	0.94
∅ Ionic Balance	----	0.01	%	29.3	20.4	21.5	0.34	11.8
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	30	36	29	31	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	----	----	----	134
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.87	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	3.21	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW301_210428	0958_MW136_210428	0958_MW113S_210428	0958_MW109S_210428	0958_MW110S_210428
Sampling date / time				28-Apr-2021 10:57	28-Apr-2021 11:21	28-Apr-2021 11:35	28-Apr-2021 11:47	28-Apr-2021 12:08
Compound	CAS Number	LOR	Unit	EP2104666-006	EP2104666-007	EP2104666-008	EP2104666-009	EP2104666-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	10.9	0.05	<0.02	0.07	0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	1.08	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	26.7	0.09	0.02	0.42	0.07
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.2	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.50	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	4.16	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.74	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	1.32	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW301_210428	0958_MW136_210428	0958_MW113S_21042 8	0958_MW109S_21042 8	0958_MW110S_21042 8
Sampling date / time				28-Apr-2021 10:57	28-Apr-2021 11:21	28-Apr-2021 11:35	28-Apr-2021 11:47	28-Apr-2021 12:08
Compound	CAS Number	LOR	Unit	EP2104666-006	EP2104666-007	EP2104666-008	EP2104666-009	EP2104666-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	49.7	0.14	0.02	0.49	0.09
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	37.6	0.14	0.02	0.49	0.09
Sum of PFAS (WA DER List)	----	0.01	µg/L	45.4	0.14	0.02	0.49	0.09
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	97.8	91.2	93.8	93.5	96.3
13C8-PFOA	----	0.02	%	110	110	104	110	105



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW505_210428	0958_MW115S_210428	----	----	----
Sampling date / time				28-Apr-2021 12:45	28-Apr-2021 12:56	----	----	----
Compound	CAS Number	LOR	Unit	EP2104666-011	EP2104666-012	-----	-----	-----
Result				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.70	4.20	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	160	184	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	282	2520	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	15	<1	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	15	<1	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	9	<1	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	19	19	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	13	6	----	----	----
Magnesium	7439-95-4	1	mg/L	2	2	----	----	----
Sodium	7440-23-5	1	mg/L	15	10	----	----	----
Potassium	7440-09-7	1	mg/L	6	<1	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.02	0.54	----	----	----
∅ Total Cations	----	0.01	meq/L	1.62	0.90	----	----	----
∅ Ionic Balance	----	0.01	%	22.6	25.3	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	12	40	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.05	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.53	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW505_210428	0958_MW115S_210428	----	----	----
				28-Apr-2021 12:45	28-Apr-2021 12:56	----	----	----
Compound	CAS Number	LOR	Unit	EP2104666-011	EP2104666-012	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.97	0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.11	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW505_210428	0958_MW115S_210428	----	----	----
				28-Apr-2021 12:45	28-Apr-2021 12:56	----	----	----
Compound	CAS Number	LOR	Unit	EP2104666-011	EP2104666-012	-----	-----	-----
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.74	0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.50	0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.67	0.01	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	88.8	94.1	----	----	----
13C8-PFOA	----	0.02	%	110	108	----	----	----

Page : 12 of 12
Work Order : EP2104666
Client : CARDNO (WA) PTY LTD
Project : WA_0958_PFASOMP



Surrogate Control Limits

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

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

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2104666	Page	: 1 of 12
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Apr-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 30-Apr-2021
C-O-C number	: 22109	Issue Date	: 11-May-2021
Sampler	: [REDACTED] [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3665098)									
EP2104666-016	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	4.86	4.78	1.7	0% - 20%
EP2104610-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.20	8.17	0.4	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3665103)									
EP2104666-010	0958_MW110S_210428	EA005-P: pH Value	----	0.01	pH Unit	4.95	4.81	2.9	0% - 20%
EP2104675-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.11	8.12	0.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3659369)									
EP2104666-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	93	88	4.7	No Limit
EP2104666-015	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	126	130	3.1	0% - 50%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3659377)									
EP2104666-010	0958_MW110S_210428	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	286	288	0.522	0% - 20%
EP2104679-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	106	125	16.4	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3659370)									
EP2104666-007	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	86	73	16.1	0% - 50%
EP2104666-001	0958_MW102D_210428	EA025H: Suspended Solids (SS)	----	5	mg/L	79	80	2.2	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3659378)									
EP2104666-010	0958_MW110S_210428	EA025H: Suspended Solids (SS)	----	5	mg/L	1580	1640	3.8	0% - 20%
EP2104679-009	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	48	28	51.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3665099)									
EP2104666-016	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	<1	<1	0.0	No Limit
EP2104610-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3665099) - continued									
EP2104610-001	Anonymous	ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	349	350	0.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	349	350	0.3	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3665102)									
EP2104666-010	0958_MW110S_210428	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
EP2104675-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	143	141	1.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	143	141	1.3	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3650164)									
EP2104666-011	0958_MW505_210428	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	9	7	29.1	No Limit
EP2104679-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	19	19	0.00	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3650166)									
EP2104665-007	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	15	12	26.0	0% - 50%
EP2104666-001	0958_MW102D_210428	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	40	39	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3650165)									
EP2104666-011	0958_MW505_210428	ED045G: Chloride	16887-00-6	1	mg/L	19	19	0.00	0% - 50%
EP2104679-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	34	34	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3650167)									
EP2104665-007	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	13	13	0.0	0% - 50%
EP2104666-001	0958_MW102D_210428	ED045G: Chloride	16887-00-6	1	mg/L	31	31	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3651488)									
EP2104665-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	5	5	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	3	3	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	9	9	0.00	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
EP2104666-001	0958_MW102D_210428	ED093F: Calcium	7440-70-2	1	mg/L	44	44	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	9	9	0.00	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3651489)									
EP2104666-011	0958_MW505_210428	ED093F: Calcium	7440-70-2	1	mg/L	13	12	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	15	15	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	6	6	0.00	No Limit
EP2104679-009	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED093F: Dissolved Major Cations (QC Lot: 3651489) - continued									
EP2104679-009	Anonymous	ED093F: Sodium	7440-23-5	1	mg/L	19	19	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3653047)									
EP2104578-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	5	5	0.00	No Limit
EP2104665-013	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	15	15	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3653275)									
EP2104666-007	0958_MW136_210428	EP002: Dissolved Organic Carbon	----	1	mg/L	36	38	6.83	0% - 20%
EP2104679-007	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	18	18	0.00	0% - 50%
EP005: Total Organic Carbon (TOC) (QC Lot: 3655838)									
EP2104614-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2104725-010	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3666435)									
EP2104665-008	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.13	1.18	4.2	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.07	0.08	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.13	0.14	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.33	1.28	4.2	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.07	0.06	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3666437)									
EP2104666-011	0958_MW505_210428	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.97	0.87	10.1	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.05	0.04	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.53	0.46	14.0	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.02	0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3666435)									
EP2104665-008	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.08	0.08	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.19	0.18	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3666437)									
EP2104666-011	0958_MW505_210428	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	0.02	0.0	No Limit

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3666437) - continued									
EP2104666-011	0958_MW505_210428	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.11	0.09	17.7	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3666435)									
EP2104665-008	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3666437)									
EP2104666-011	0958_MW505_210428	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3666435)									

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 Work Order : EP2104666
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3666435) - continued									
EP2104665-008	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3666437)									
EP2104666-011	0958_MW505_210428	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3666435)									
EP2104665-008	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	3.06	3.06	0.0	0% - 20%
EP231P: PFAS Sums (QC Lot: 3666437)									
EP2104666-011	0958_MW505_210428	EP231X: Sum of PFAS	----	0.01	µg/L	1.74	1.52	13.5	0% - 20%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3665098)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3665103)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3659369)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	98.9	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3659377)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	104	88.1	114
				<10	1000 mg/L	105	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3659370)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	92.6	89.1	120
				<5	1000 mg/L	102	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3659378)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	93.7	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3665099)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	108	81.2	126
				<1	200 mg/L	95.8	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3665102)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	113	81.2	126
				<1	200 mg/L	96.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650164)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	97.2	87.7	113



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650166)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.6	87.7	113
				<1	500 mg/L	97.5	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3650165)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.6	87.9	114
				<1	1000 mg/L	98.9	87.9	114
ED045G: Chloride by Discrete Analyser (QCLot: 3650167)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	104	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3651488)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.6	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.2	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3651489)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.8	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653047)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	102	73.2	116
				<1	100 mg/L	101	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653275)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	104	73.2	116
				<1	100 mg/L	103	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3655838)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	100	87.2	116
				<1	100 mg/L	99.2	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666435)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	85.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	98.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	87.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	112	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666437)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	125	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	120	68.0	131



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666437) - continued								
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	123	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	102	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	138	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666435)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	96.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	99.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	96.0	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	96.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	99.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	96.3	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666437)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	116	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	130	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	126	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	116	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	121	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	123	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	129	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	141	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	119	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666435)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	93.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	96.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	108	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	106	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	102	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	112	61.0	135



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666437)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	109	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	114	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	121	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	118	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	128	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	128	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	129	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666435)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	127	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	89.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	105	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	110	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666437)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	132	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	105	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	116	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	106	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650164)							
EP2104666-011	0958_MW505_210428	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	126	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650166)							
EP2104665-007	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	103	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3650165)							
EP2104666-011	0958_MW505_210428	ED045G: Chloride	16887-00-6	1000 mg/L	98.7	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3650167)							
EP2104665-007	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	103	70.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653047)							
EP2104578-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653275)							
EP2104666-008	0958_MW113S_210428	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3655838)							
EP2104614-006	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	101	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666435)							
EP2104665-012	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	# Not Determined	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	# Not Determined	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666437)							
EP2104679-008	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	114	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	121	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	126	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	132	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	114	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	# 145	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666435)							
EP2104665-012	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	119	73.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	# 49.0	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	# 47.6	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	103	69.0	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	110	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	108	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTTeDA)	376-06-7	0.625 µg/L	109	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666437)							
EP2104679-008	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	113	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	128	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	123	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	# 132	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	# 135	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	120	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	129	71.0	129



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666437) - continued							
EP2104679-008	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	125	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	129	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	126	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	118	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666435)							
EP2104665-012	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	111	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	122	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	108	62.6	147
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	126	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	121	65.0	136
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666437)							
EP2104679-008	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	105	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	108	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	104	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	106	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	123	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	130	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	127	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666435)							
EP2104665-012	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	108	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	100	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	114	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666437)							
EP2104679-008	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	130	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	116	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	98.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	99.0	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2104666	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Apr-2021
Site	: DEF19009/Gingin	Issue Date	: 11-May-2021
Sampler	: [REDACTED] [REDACTED]	No. of samples received	: 12
Order number	: DEF19009/330	No. of samples analysed	: 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2104665--012	Anonymous	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2104679--008	Anonymous	Perfluorodecane sulfonic acid (PFDS)	335-77-3	145 %	53.0-142%	Recovery greater than upper data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104665--012	Anonymous	Perfluorohexanoic acid (PFHxA)	307-24-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104665--012	Anonymous	Perfluoroheptanoic acid (PFHpA)	375-85-9	49.0 %	72.0-130%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104679--008	Anonymous	Perfluoroheptanoic acid (PFHpA)	375-85-9	132 %	72.0-130%	Recovery greater than upper data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104665--012	Anonymous	Perfluorooctanoic acid (PFOA)	335-67-1	47.6 %	71.0-133%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104679--008	Anonymous	Perfluorooctanoic acid (PFOA)	335-67-1	135 %	71.0-133%	Recovery greater than upper data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW102D_210428,	0958_QC104_210428,	----	----	----	07-May-2021	28-Apr-2021	9
0958_MW101I_210428,	0958_MW302_210428,						
0958_MW303_210428,	0958_MW301_210428,						
0958_MW136_210428,	0958_MW113S_210428,						
0958_MW109S_210428,	0958_MW110S_210428,						
0958_MW505_210428,	0958_MW115S_210428						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	39	5.13	10.00	NEPM 2013 B3 & ALS QC Standard



Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428, 0958_MW505_210428,	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW110S_210428, 0958_MW115S_210428	28-Apr-2021	----	----	----	07-May-2021	28-Apr-2021	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428, 0958_MW505_210428,	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW110S_210428, 0958_MW115S_210428	28-Apr-2021	----	----	----	05-May-2021	05-May-2021	✔
EA025: Total Suspended Solids dried at 104 ± 2 °C								
Clear Plastic Bottle - Natural (EA025H) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428, 0958_MW505_210428,	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW110S_210428, 0958_MW115S_210428	28-Apr-2021	----	----	----	05-May-2021	05-May-2021	✔
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428, 0958_MW505_210428,	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW110S_210428, 0958_MW115S_210428	28-Apr-2021	----	----	----	07-May-2021	12-May-2021	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0958_MW505_210428,	0958_MW115S_210428	28-Apr-2021	----	----	----	05-May-2021	26-May-2021	✓
Clear Plastic Bottle - Natural (ED041G) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428,	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW110S_210428	28-Apr-2021	----	----	----	10-May-2021	26-May-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0958_MW505_210428,	0958_MW115S_210428	28-Apr-2021	----	----	----	05-May-2021	26-May-2021	✓
Clear Plastic Bottle - Natural (ED045G) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428,	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW110S_210428	28-Apr-2021	----	----	----	10-May-2021	26-May-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428, 0958_MW505_210428,	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW110S_210428, 0958_MW115S_210428	28-Apr-2021	----	----	----	30-Apr-2021	05-May-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0958_MW102D_210428, 0958_MW101I_210428, 0958_MW303_210428, 0958_MW136_210428, 0958_MW109S_210428, 0958_MW115S_210428	0958_QC104_210428, 0958_MW302_210428, 0958_MW301_210428, 0958_MW113S_210428, 0958_MW505_210428,	28-Apr-2021	----	----	----	30-Apr-2021	26-May-2021	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005) 0958_MW110S_210428		28-Apr-2021	----	----	----	03-May-2021	26-May-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW102D_210428,	0958_QC104_210428,							
0958_MW101I_210428,	0958_MW302_210428,							
0958_MW303_210428,	0958_MW301_210428,							
0958_MW136_210428,	0958_MW113S_210428,							
0958_MW109S_210428,	0958_MW110S_210428,							
0958_MW505_210428,	0958_MW115S_210428							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW102D_210428,	0958_QC104_210428,							
0958_MW101I_210428,	0958_MW302_210428,							
0958_MW303_210428,	0958_MW301_210428,							
0958_MW136_210428,	0958_MW113S_210428,							
0958_MW109S_210428,	0958_MW110S_210428,							
0958_MW505_210428,	0958_MW115S_210428							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW102D_210428,	0958_QC104_210428,							
0958_MW101I_210428,	0958_MW302_210428,							
0958_MW303_210428,	0958_MW301_210428,							
0958_MW136_210428,	0958_MW113S_210428,							
0958_MW109S_210428,	0958_MW110S_210428,							
0958_MW505_210428,	0958_MW115S_210428							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW102D_210428,	0958_QC104_210428,							
0958_MW101I_210428,	0958_MW302_210428,							
0958_MW303_210428,	0958_MW301_210428,							
0958_MW136_210428,	0958_MW113S_210428,							
0958_MW109S_210428,	0958_MW110S_210428,							
0958_MW505_210428,	0958_MW115S_210428							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW102D_210428,	0958_QC104_210428,							
0958_MW101I_210428,	0958_MW302_210428,							
0958_MW303_210428,	0958_MW301_210428,							
0958_MW136_210428,	0958_MW113S_210428,							
0958_MW109S_210428,	0958_MW110S_210428,							
0958_MW505_210428,	0958_MW115S_210428							



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	35	11.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	5.13	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	35	11.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	37	10.81	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	35	11.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	37	10.81	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	37	5.41	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	39	5.13	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2104666**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: [REDACTED]@cardno.com.au	E-mail	: [REDACTED]@alsglobal.com
Telephone	: ----	Telephone	: [REDACTED]
Facsimile	: ----	Facsimile	: [REDACTED]
Project	: WA_0958_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/330	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 22109	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Gingin		
Sampler	: [REDACTED] [REDACTED]		

Dates

Date Samples Received	: 28-Apr-2021 16:20	Issue Date	: 29-Apr-2021
Client Requested Due Date	: 10-May-2021	Scheduled Reporting Date	: 10-May-2021

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 6.8 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 12 / 12

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2104666-001	28-Apr-2021 09:58	0958_MW102D_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-002	28-Apr-2021 10:00	0958_QC104_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-003	28-Apr-2021 10:22	0958_MW101I_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-004	28-Apr-2021 10:37	0958_MW302_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-005	28-Apr-2021 10:47	0958_MW303_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-006	28-Apr-2021 10:57	0958_MW301_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-007	28-Apr-2021 11:21	0958_MW136_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-008	28-Apr-2021 11:35	0958_MW113S_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-009	28-Apr-2021 11:47	0958_MW109S_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-010	28-Apr-2021 12:08	0958_MW110S_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-011	28-Apr-2021 12:45	0958_MW505_210428	✓	✓	✓	✓	✓	✓	✓
EP2104666-012	28-Apr-2021 12:56	0958_MW115S_210428	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2104666-001	28-Apr-2021 09:58	0958_MW102D_210428		✓
EP2104666-002	28-Apr-2021 10:00	0958_QC104_210428		✓
EP2104666-003	28-Apr-2021 10:22	0958_MW101I_210428		✓
EP2104666-004	28-Apr-2021 10:37	0958_MW302_210428		✓
EP2104666-005	28-Apr-2021 10:47	0958_MW303_210428		✓
EP2104666-006	28-Apr-2021 10:57	0958_MW301_210428		✓
EP2104666-007	28-Apr-2021 11:21	0958_MW136_210428		✓
EP2104666-008	28-Apr-2021 11:35	0958_MW113S_210428		✓
EP2104666-009	28-Apr-2021 11:47	0958_MW109S_210428		✓
EP2104666-010	28-Apr-2021 12:08	0958_MW110S_210428	✓	✓
EP2104666-011	28-Apr-2021 12:45	0958_MW505_210428		✓
EP2104666-012	28-Apr-2021 12:56	0958_MW115S_210428		✓



Proactive Holding Time Report

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

Requested Deliverables

[REDACTED]	- A4 - AU Tax Invoice (INV)	Email	[REDACTED]
DERP LAB REPORTS			
[REDACTED]	- EDI Format - ESDAT (ESDAT)	Email	[REDACTED]
[REDACTED]	- *AU Certificate of Analysis - NATA (COA)	Email	[REDACTED] cardno.com.au
	- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	[REDACTED] cardno.com.au
	- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	[REDACTED] cardno.com.au
	- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	[REDACTED] cardno.com.au
	- Chain of Custody (CoC) (COC)	Email	[REDACTED] cardno.com.au
	- EDI Format - ESDAT (ESDAT)	Email	[REDACTED] cardno.com.au
	- EDI Format - XTab (XTAB)	Email	[REDACTED] cardno.com.au



ALS Compass

SAMPLING *Intelligence*



Environmental Division
Perth
Work Order Reference
EP2104666



Telephone : -- 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: WA_0958_PFASOMP Client: Cardno Project Manager: [REDACTED]
ALS Compass COC Reference: 22106 # Samples: 22111 Phone: [REDACTED]
22109 Sampler: [REDACTED]
Turnaround Requirements: Standard Phone: [REDACTED]

Special Instructions:

Please send QC 204 - 207 to Eurofins

Custody:

Relinquished by: <u>[REDACTED]</u> 28/04/21	Received by: <u>[REDACTED]</u> 28/4/21 1620	Relinquished by:	Received by:
Date / Time:	Date / Time:	Date / Time:	Date / Time:

**CHAIN OF CUSTODY**

COC#: 22109

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA 0958 PFASOMP

SITE: DEF19009/Gingin - GW AB

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes

No

N/A

Free ice / frozen ice bricks present upon receipt?

Yes

No

N/A

Random Sample Temperature on Receipt:

°C

Other comments:

6.8

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW102D		28/04/2021 09:58 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_QC104		28/04/2021 10:00 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0958_MW101I		28/04/2021 10:22 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_MW302		28/04/2021 10:37 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_MW303		28/04/2021 10:47 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0958_MW301		28/04/2021 10:57 AM	Water	ALS: 4 Non ALS: 0	No	X			
007	0958_MW136		28/04/2021 11:21 AM	Water	ALS: 4 Non ALS: 0	No	X			
008	0958_MW112S		28/04/2021 11:35 AM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_MW109S		28/04/2021 11:47 AM	Water	ALS: 4 Non ALS: 0	No	X			

**CHAIN OF CUSTODY**

COC#: 22109

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: DEF19009/Gingin - GW AB

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_MW110S	plus toc	28/04/2021 12:08 PM	Water	ALS: 3 Non ALS: 0	No	Partial 7/8	X		
011	0958_MW505		28/04/2021 12:45 PM	Water	ALS: 6 Non ALS: 0	No	X			
012	0958_MW115S		28/04/2021 12:56 PM	Water	ALS: 4 Non ALS: 0	No	X			

**CHAIN OF CUSTODY**

COC#: 22109

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - GW AB

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
010	0958_MW110S	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)

**CHAIN OF CUSTODY**

COC#: 22109 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958 PFASOMP

SITE: DEF19009/Gingin - GW AB

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW102D	HDPE (no PTFE)	20 mL	00352010070701	Grey	No	
001	0958_MW102D	HDPE (no PTFE)	20 mL	00352010070764	Grey	No	
001	0958_MW102D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018986	Purple	No	
001	0958_MW102D	Clear Plastic Bottle - Natural	250 mL	00071020084207	Green	No	
002	0958_QC104	HDPE (no PTFE)	20 mL	00352010070785	Grey	No	
002	0958_QC104	HDPE (no PTFE)	20 mL	00352010070544	Grey	No	
002	0958_QC104	Clear Plastic Bottle - Natural	250 mL	00071020084184	Green	No	
002	0958_QC104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018708	Purple	No	
003	0958_MW101I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019036	Purple	No	
003	0958_MW101I	Clear Plastic Bottle - Natural	250 mL	00071020084204	Green	No	
003	0958_MW101I	HDPE (no PTFE)	20 mL	00352010070582	Grey	No	
003	0958_MW101I	HDPE (no PTFE)	20 mL	00352010070702	Grey	No	
004	0958_MW302	Clear Plastic Bottle - Natural	250 mL	00071020084248	Green	No	
004	0958_MW302	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018007	Purple	No	
004	0958_MW302	HDPE (no PTFE)	20 mL	00352010070502	Grey	No	
004	0958_MW302	HDPE (no PTFE)	20 mL	00352010070679	Grey	No	
005	0958_MW303	Clear Plastic Bottle - Natural	250 mL	00071020084238	Green	No	
005	0958_MW303	HDPE (no PTFE)	20 mL	00352010070653	Grey	No	
005	0958_MW303	HDPE (no PTFE)	20 mL	00352010070504	Grey	No	
005	0958_MW303	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018928	Purple	No	
006	0958_MW301	Clear Plastic Bottle - Natural	250 mL	00071020084185	Green	No	
006	0958_MW301	HDPE (no PTFE)	20 mL	00352010070677	Grey	No	
006	0958_MW301	HDPE (no PTFE)	20 mL	00352010070509	Grey	No	
006	0958_MW301	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019027	Purple	No	
007	0958_MW136	HDPE (no PTFE)	20 mL	00352010070627	Grey	No	
007	0958_MW136	HDPE (no PTFE)	20 mL	00352010070712	Grey	No	



CHAIN OF CUSTODY

COC#: 22109

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - GW AB

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

007	0958_MW136	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018967	Purple	No	
007	0958_MW136	Clear Plastic Bottle - Natural	250 mL	00071020084181	Green	No	
008	0958_MW112S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018006	Purple	No	
008	0958_MW112S	HDPE (no PTFE)	20 mL	00352010070498	Grey	No	
008	0958_MW112S	HDPE (no PTFE)	20 mL	00352010070746	Grey	No	
008	0958_MW112S	Clear Plastic Bottle - Natural	250 mL	00071020084265	Green	No	
009	0958_MW109S	Clear Plastic Bottle - Natural	250 mL	00071020084191	Green	No	
009	0958_MW109S	HDPE (no PTFE)	20 mL	00352010070511	Grey	No	
009	0958_MW109S	HDPE (no PTFE)	20 mL	00352010070625	Grey	No	
009	0958_MW109S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019020	Purple	No	
010	0958_MW110S	HDPE (no PTFE)	20 mL	00352010070760	Grey	No	
010	0958_MW110S	HDPE (no PTFE)	20 mL	00352010070556	Grey	No	
010	0958_MW110S	Clear Plastic Bottle - Natural	250 mL	00071020084215	Green	No	
011	0958_MW505	HDPE (no PTFE)	20 mL	00352010070681	Grey	No	
011	0958_MW505	HDPE (no PTFE)	20 mL	00350019164426	Grey	No	
011	0958_MW505	HDPE (no PTFE)	20 mL	00352010070727	Grey	No	
011	0958_MW505	HDPE (no PTFE)	20 mL	00350019163968	Grey	No	
011	0958_MW505	Clear Plastic Bottle - Natural	250 mL	00071020084151	Green	No	
011	0958_MW505	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019395	Purple	No	
012	0958_MW115S	Clear Plastic Bottle - Natural	250 mL	00071020084196	Green	No	
012	0958_MW115S	HDPE (no PTFE)	20 mL	00352010070777	Grey	No	
012	0958_MW115S	HDPE (no PTFE)	20 mL	00352010070515	Grey	No	
012	0958_MW115S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018975	Purple	No	

Total Bottle Count: ALS: 49, Non ALS: 0

CERTIFICATE OF ANALYSIS

Work Order : **EP2104679**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 22111
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 12
No. of samples analysed : 12

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 28-Apr-2021 16:20
Date Analysis Commenced : 30-Apr-2021
Issue Date : 10-May-2021 16:55



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW124D_21042 8	0958_MW122S_21042 8	0958_MW123I_21042 8	0958_MW121D_21042 8	0958_MW120I_21042 8
Sampling date / time				28-Apr-2021 09:44	28-Apr-2021 10:01	28-Apr-2021 10:18	28-Apr-2021 10:49	28-Apr-2021 11:15
Compound	CAS Number	LOR	Unit	EP2104679-001	EP2104679-002	EP2104679-003	EP2104679-004	EP2104679-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.53	4.92	5.58	6.84	6.04
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	157	----	162	177	97
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	30	----	30	31	64
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	24	<1	4	40	5
Total Alkalinity as CaCO3	----	1	mg/L	24	<1	4	40	5
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	8	19	<1	8
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	45	26	34	40	14
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	4	4	3	8	6
Magnesium	7439-95-4	1	mg/L	3	2	5	2	2
Sodium	7440-23-5	1	mg/L	27	20	23	30	8
Potassium	7440-09-7	1	mg/L	4	4	2	3	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.75	0.90	1.43	1.93	0.66
∅ Total Cations	----	0.01	meq/L	1.72	1.34	1.61	1.94	0.81
∅ Ionic Balance	----	0.01	%	0.74	----	5.85	0.46	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	7	----	21	12	21
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.08	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW124D_21042 8	0958_MW122S_21042 8	0958_MW123I_21042 8	0958_MW121D_21042 8	0958_MW120I_21042 8
Sampling date / time				28-Apr-2021 09:44	28-Apr-2021 10:01	28-Apr-2021 10:18	28-Apr-2021 10:49	28-Apr-2021 11:15
Compound	CAS Number	LOR	Unit	EP2104679-001	EP2104679-002	EP2104679-003	EP2104679-004	EP2104679-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.05	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW124D_21042 8	0958_MW122S_21042 8	0958_MW123I_21042 8	0958_MW121D_21042 8	0958_MW120I_21042 8
Sampling date / time				28-Apr-2021 09:44	28-Apr-2021 10:01	28-Apr-2021 10:18	28-Apr-2021 10:49	28-Apr-2021 11:15
Compound	CAS Number	LOR	Unit	EP2104679-001	EP2104679-002	EP2104679-003	EP2104679-004	EP2104679-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.13	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.13	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.13	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	91.6	96.1	97.1	86.6	92.6
13C8-PFOA	----	0.02	%	107	106	109	108	111



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_QC106_210428	0958_MW119S_210428	0958_MW118D_210428	0958_MW117I_210428	0958_MW116S_210428
				8	8	8	8	8
Sampling date / time				28-Apr-2021 11:16	28-Apr-2021 11:33	28-Apr-2021 11:52	28-Apr-2021 12:10	28-Apr-2021 12:26
Compound	CAS Number	LOR	Unit	EP2104679-006	EP2104679-007	EP2104679-008	EP2104679-009	EP2104679-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	5.91	4.29	6.38	6.46	4.23
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	110	106	148	105	170
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	53	786	9	48	151
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	4	<1	14	11	<1
Total Alkalinity as CaCO3	----	1	mg/L	4	<1	14	11	<1
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	8	9	<1	<1	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	13	15	46	25	26
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	5	7	1	<1	5
Magnesium	7439-95-4	1	mg/L	2	2	3	2	3
Sodium	7440-23-5	1	mg/L	8	9	30	19	15
Potassium	7440-09-7	1	mg/L	<1	<1	3	<1	<1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	0.61	0.61	1.58	0.92	0.73
∅ Total Cations	----	0.01	meq/L	0.76	0.90	1.68	0.99	1.15
∅ Ionic Balance	----	0.01	%	----	----	3.11	3.45	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	21	18	11	15	39
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	0.03	0.04
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_QC106_210428	0958_MW119S_210428	0958_MW118D_210428	0958_MW117I_210428	0958_MW116S_210428
					8	8	8	8
Sampling date / time				28-Apr-2021 11:16	28-Apr-2021 11:33	28-Apr-2021 11:52	28-Apr-2021 12:10	28-Apr-2021 12:26
Compound	CAS Number	LOR	Unit	EP2104679-006	EP2104679-007	EP2104679-008	EP2104679-009	EP2104679-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.02	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_QC106_210428	0958_MW119S_210428	0958_MW118D_210428	0958_MW117I_210428	0958_MW116S_210428
					8	8	8	8
Sampling date / time				28-Apr-2021 11:16	28-Apr-2021 11:33	28-Apr-2021 11:52	28-Apr-2021 12:10	28-Apr-2021 12:26
Compound	CAS Number	LOR	Unit	EP2104679-006	EP2104679-007	EP2104679-008	EP2104679-009	EP2104679-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	0.02	<0.01	0.03	0.04
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.02	<0.01	0.03	0.04
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	0.02	<0.01	0.03	0.04
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	92.4	92.4	91.1	95.0	96.3
13C8-PFOA	----	0.02	%	107	105	107	110	107



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW142S_21042 8	0958_MW141S_21042 8	----	----	----
Sampling date / time				28-Apr-2021 14:31	28-Apr-2021 14:54	----	----	----
Compound	CAS Number	LOR	Unit	EP2104679-011	EP2104679-012	-----	-----	-----
Result				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	4.25	4.46	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	224	254	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	67	46	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	6	25	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	49	54	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	1	----	----	----
Magnesium	7439-95-4	1	mg/L	4	7	----	----	----
Sodium	7440-23-5	1	mg/L	34	35	----	----	----
Potassium	7440-09-7	1	mg/L	2	2	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.51	2.04	----	----	----
∅ Total Cations	----	0.01	meq/L	1.86	2.20	----	----	----
∅ Ionic Balance	----	0.01	%	----	3.67	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	45	43	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.07	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.09	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.66	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.04	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW142S_21042 8	0958_MW141S_21042 8	----	----	----
Sampling date / time				28-Apr-2021 14:31	28-Apr-2021 14:54	----	----	----
Compound	CAS Number	LOR	Unit	EP2104679-011	EP2104679-012	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.27	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.16	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.04	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW142S_21042 8	0958_MW141S_21042 8	----	----	----
Sampling date / time				28-Apr-2021 14:31	28-Apr-2021 14:54	----	----	----
Compound	CAS Number	LOR	Unit	EP2104679-011	EP2104679-012	-----	-----	-----
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	1.37	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.93	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	1.24	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	95.6	87.3	----	----	----
13C8-PFOA	----	0.02	%	104	100	----	----	----

Page : 12 of 12
Work Order : EP2104679
Client : CARDNO (WA) PTY LTD
Project : WA_0958_PFASOMP



Surrogate Control Limits

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

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

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2104679	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Apr-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 30-Apr-2021
C-O-C number	: 22111	Issue Date	: 10-May-2021
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3665103)									
EP2104666-010	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	4.95	4.81	2.9	0% - 20%
EP2104675-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.11	8.12	0.1	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3665105)									
EP2104679-004	0958_MW121D_210428	EA005-P: pH Value	----	0.01	pH Unit	6.84	6.80	0.6	0% - 20%
EP2104682-006	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.01	8.03	0.2	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3659377)									
EP2104666-010	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	286	288	0.522	0% - 20%
EP2104679-007	0958_MW119S_210428	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	106	125	16.4	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3659378)									
EP2104666-010	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1580	1640	3.8	0% - 20%
EP2104679-009	0958_MW117I_210428	EA025H: Suspended Solids (SS)	----	5	mg/L	48	28	51.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3665102)									
EP2104666-010	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
EP2104675-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	143	141	1.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	143	141	1.3	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3665104)									
EP2104679-004	0958_MW121D_210428	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	40	40	0.0	0% - 20%



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3665104) - continued									
EP2104679-004	0958_MW121D_210428	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	40	40	0.0	0% - 20%
EP2104682-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	71	71	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	71	71	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3650164)									
EP2104666-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	9	7	29.1	No Limit
EP2104679-003	0958_MW123I_210428	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	19	19	0.00	0% - 50%
ED045G: Chloride by Discrete Analyser (QC Lot: 3650165)									
EP2104666-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19	19	0.00	0% - 50%
EP2104679-003	0958_MW123I_210428	ED045G: Chloride	16887-00-6	1	mg/L	34	34	0.00	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3651489)									
EP2104666-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	13	12	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	15	15	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	6	6	0.00	No Limit
EP2104679-009	0958_MW117I_210428	ED093F: Calcium	7440-70-2	1	mg/L	<1	1	0.00	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	19	19	0.00	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3653275)									
EP2104666-007	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	36	38	6.83	0% - 20%
EP2104679-007	0958_MW119S_210428	EP002: Dissolved Organic Carbon	----	1	mg/L	18	18	0.00	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3666437)									
EP2104666-011	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.97	0.87	10.1	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.05	0.04	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.53	0.46	14.0	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.02	0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3666437)									
EP2104666-011	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.11	0.09	17.7	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDODA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit

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 Work Order : EP2104679
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFSOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3666437) - continued									
EP2104666-011	Anonymous	EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3666437)									
EP2104666-011	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3666437)									
EP2104666-011	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3666437)									
EP2104666-011	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	1.74	1.52	13.5	0% - 20%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3665103)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3665105)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	101	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3659377)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	104	88.1	114
				<10	1000 mg/L	105	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3659378)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	93.7	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3665102)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	113	81.2	126
				<1	200 mg/L	96.7	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3665104)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	109	81.2	126
				<1	200 mg/L	96.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650164)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	97.2	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3650165)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.6	87.9	114
				<1	1000 mg/L	98.9	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3651489)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	101	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	88.0	110



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
ED093F: Dissolved Major Cations (QCLot: 3651489) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.8	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653275)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	104	73.2	116
				<1	100 mg/L	103	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666437)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	125	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	120	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	123	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	102	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	138	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666558)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	97.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	122	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	103	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	99.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	119	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666437)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	116	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	130	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	126	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	116	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	121	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	123	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	129	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	141	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	119	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666558)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	102	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	109	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	109	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	122	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	116	69.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666558) - continued								
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	125	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	124	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	113	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	116	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666437)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	109	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	114	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	121	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	118	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	128	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	128	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	129	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666558)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	98.6	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	101	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	102	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	99.5	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	106	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	115	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	117	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666437)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	132	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	105	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	116	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	106	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666558)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	111	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	109	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	108	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	103	71.4	144



Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3650164)							
EP2104666-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	126	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3650165)							
EP2104666-011	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	98.7	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3653275)							
EP2104666-008	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	103	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3666437)							
EP2104679-008	0958_MW118D_210428	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	114	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	121	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	126	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	132	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	114	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	# 145	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3666437)							
EP2104679-008	0958_MW118D_210428	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	113	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	128	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	123	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	# 132	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	# 135	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	120	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	129	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	125	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	129	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	126	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	118	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666437)							
EP2104679-008	0958_MW118D_210428	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	105	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	108	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	104	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	106	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	123	57.6	145

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Work Order : EP2104679
Client : CARDNO (WA) PTY LTD
Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3666437) - continued							
EP2104679-008	0958_MW118D_210428	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	130	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	127	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3666437)							
EP2104679-008	0958_MW118D_210428	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	130	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	116	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	98.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	99.0	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2104679	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 28-Apr-2021
Site	: DEF19009/Gingin	Issue Date	: 10-May-2021
Sampler	: [REDACTED] [REDACTED]	No. of samples received	: 12
Order number	: DEF19009/330	No. of samples analysed	: 12

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2104679--008	0958_MW118D_210428	Perfluorodecane sulfonic acid (PFDS)	335-77-3	145 %	53.0-142%	Recovery greater than upper data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104679--008	0958_MW118D_210428	Perfluoroheptanoic acid (PFHpA)	375-85-9	132 %	72.0-130%	Recovery greater than upper data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EP2104679--008	0958_MW118D_210428	Perfluorooctanoic acid (PFOA)	335-67-1	135 %	71.0-133%	Recovery greater than upper data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW124D_210428,	0958_MW122S_210428,	----	----	----	07-May-2021	28-Apr-2021	9
0958_MW123I_210428,	0958_MW121D_210428,						
0958_MW120I_210428,	0958_QC106_210428,						
0958_MW119S_210428,	0958_MW118D_210428,						
0958_MW117I_210428,	0958_MW116S_210428,						
0958_MW142S_210428,	0958_MW141S_210428						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	24	4.17	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	24	4.17	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Page : 3 of 8
 Work Order : EP2104679
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFSOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) 0958_MW124D_210428, 0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	0958_MW122S_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	28-Apr-2021	----	----	----	07-May-2021 28-Apr-2021	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0958_MW124D_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	28-Apr-2021	----	----	----	05-May-2021 05-May-2021	✔
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0958_MW124D_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	28-Apr-2021	----	----	----	05-May-2021 05-May-2021	✔
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0958_MW124D_210428, 0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	0958_MW122S_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	28-Apr-2021	----	----	----	07-May-2021 12-May-2021	✔
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0958_MW124D_210428, 0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	0958_MW122S_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	28-Apr-2021	----	----	----	05-May-2021 26-May-2021	✔

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 Work Order : EP2104679
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0958_MW124D_210428, 0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	0958_MW122S_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	28-Apr-2021	----	----	----	05-May-2021	26-May-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0958_MW124D_210428, 0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	0958_MW122S_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	28-Apr-2021	----	----	----	30-Apr-2021	05-May-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0958_MW124D_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	28-Apr-2021	----	----	----	30-Apr-2021	26-May-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0958_MW124D_210428, 0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	0958_MW122S_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	28-Apr-2021	08-May-2021	25-Oct-2021	✓	08-May-2021	25-Oct-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0958_MW124D_210428, 0958_MW123I_210428, 0958_MW120I_210428, 0958_MW119S_210428, 0958_MW117I_210428, 0958_MW142S_210428,	0958_MW122S_210428, 0958_MW121D_210428, 0958_QC106_210428, 0958_MW118D_210428, 0958_MW116S_210428, 0958_MW141S_210428	28-Apr-2021	08-May-2021	25-Oct-2021	✓	08-May-2021	25-Oct-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW124D_210428,	0958_MW122S_210428,							
0958_MW123I_210428,	0958_MW121D_210428,							
0958_MW120I_210428,	0958_QC106_210428,							
0958_MW119S_210428,	0958_MW118D_210428,							
0958_MW117I_210428,	0958_MW116S_210428,							
0958_MW142S_210428,	0958_MW141S_210428							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW124D_210428,	0958_MW122S_210428,							
0958_MW123I_210428,	0958_MW121D_210428,							
0958_MW120I_210428,	0958_QC106_210428,							
0958_MW119S_210428,	0958_MW118D_210428,							
0958_MW117I_210428,	0958_MW116S_210428,							
0958_MW142S_210428,	0958_MW141S_210428							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		28-Apr-2021	08-May-2021	25-Oct-2021	✔	08-May-2021	25-Oct-2021	✔
0958_MW124D_210428,	0958_MW122S_210428,							
0958_MW123I_210428,	0958_MW121D_210428,							
0958_MW120I_210428,	0958_QC106_210428,							
0958_MW119S_210428,	0958_MW118D_210428,							
0958_MW117I_210428,	0958_MW116S_210428,							
0958_MW142S_210428,	0958_MW141S_210428							



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	24	4.17	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	24	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	24	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	5.56	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	24	4.17	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2104679

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : [REDACTED]</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : [REDACTED]@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0958_PFASOMP</p> <p>Order number : DEF19009/330</p> <p>C-O-C number : 22111</p> <p>Site : DEF19009/Gingin</p> <p>Sampler : [REDACTED] [REDACTED]</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : [REDACTED]</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : [REDACTED]@alsglobal.com</p> <p>Telephone : [REDACTED]</p> <p>Facsimile : [REDACTED]</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Apr-2021 16:20	Issue Date : 29-Apr-2021
Client Requested Due : 10-May-2021	Scheduled Reporting Date : 10-May-2021
Date	

Delivery Details

Mode of Delivery : Client Drop Off	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 6.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 12 / 12

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2104679-001	28-Apr-2021 09:44	0958_MW124D_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-002	28-Apr-2021 10:01	0958_MW122S_210428	✓			✓		✓	✓
EP2104679-003	28-Apr-2021 10:18	0958_MW123I_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-004	28-Apr-2021 10:49	0958_MW121D_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-005	28-Apr-2021 11:15	0958_MW120I_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-006	28-Apr-2021 11:16	0958_QC106_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-007	28-Apr-2021 11:33	0958_MW119S_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-008	28-Apr-2021 11:52	0958_MW118D_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-009	28-Apr-2021 12:10	0958_MW117I_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-010	28-Apr-2021 12:26	0958_MW116S_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-011	28-Apr-2021 14:31	0958_MW142S_210428	✓	✓	✓	✓	✓	✓	✓
EP2104679-012	28-Apr-2021 14:54	0958_MW141S_210428	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2104679-001	28-Apr-2021 09:44	0958_MW124D_210428	✓
EP2104679-002	28-Apr-2021 10:01	0958_MW122S_210428	✓
EP2104679-003	28-Apr-2021 10:18	0958_MW123I_210428	✓
EP2104679-004	28-Apr-2021 10:49	0958_MW121D_210428	✓
EP2104679-005	28-Apr-2021 11:15	0958_MW120I_210428	✓
EP2104679-006	28-Apr-2021 11:16	0958_QC106_210428	✓
EP2104679-007	28-Apr-2021 11:33	0958_MW119S_210428	✓
EP2104679-008	28-Apr-2021 11:52	0958_MW118D_210428	✓
EP2104679-009	28-Apr-2021 12:10	0958_MW117I_210428	✓
EP2104679-010	28-Apr-2021 12:26	0958_MW116S_210428	✓
EP2104679-011	28-Apr-2021 14:31	0958_MW142S_210428	✓
EP2104679-012	28-Apr-2021 14:54	0958_MW141S_210428	✓



Proactive Holding Time Report

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

Requested Deliverables

██████████	- A4 - AU Tax Invoice (INV)	Email	██
DERP LAB REPORTS			
██████████	- EDI Format - ESDAT (ESDAT)	Email	██
██████████	- *AU Certificate of Analysis - NATA (COA)	Email	██████████cardno.com.au
	- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	██████████cardno.com.au
	- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	██████████cardno.com.au
	- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	██████████cardno.com.au
	- Chain of Custody (CoC) (COC)	Email	██████████cardno.com.au
	- EDI Format - ESDAT (ESDAT)	Email	██████████cardno.com.au
	- EDI Format - XTab (XTAB)	Email	██████████cardno.com.au



ALS Compass

SAMPLING *Intelligence*



Environmental Division
Perth
Work Order Reference
EP2104679



Telephone : -- 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: WA_0958_PFASOMP

Client: Cardno

Project Manager: [REDACTED]

Phone: [REDACTED]

ALS Compass COC Reference: 22106
22111
22109

Samples:

Sampler: [REDACTED]

Phone: [REDACTED]

Turnaround Requirements: Standard

Special Instructions:

Please send QC 204 - 207 to Eurofins

Custody:

Relinquished by: [REDACTED]

28/04/21

Date / Time:

Received by: [REDACTED]

Date / Time: 28/4/21
1620

Relinquished by:

Date / Time:

Received by:

Date / Time:

Right Solutions - Right Partner

alsglobal.com/als-compass



CHAIN OF CUSTODY

COC#: 22111

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters, Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW124D		28/04/2021 09:44 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0958_MW122S		28/04/2021 10:01 AM	Water	ALS: 3 Non ALS: 0	No	X		
003	0958_MW123I		28/04/2021 10:18 AM	Water	ALS: 4 Non ALS: 0	No	X		please add DOC vial. not scanned
004	0958_MW121D		28/04/2021 10:49 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0958_MW120I		28/04/2021 11:15 AM	Water	ALS: 4 Non ALS: 0	No	X		
006	0958_QC106		28/04/2021 11:16 AM	Water	ALS: 4 Non ALS: 0	No	X		
007	0958_MW119S		28/04/2021 11:33 AM	Water	ALS: 4 Non ALS: 0	No	X		
008	0958_MW118D		28/04/2021 11:52 AM	Water	ALS: 6 Non ALS: 0	No	X		
009	0958_MW117I		28/04/2021 12:10 PM	Water	ALS: 4 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 22111

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_MW116S		28/04/2021 12:26 PM	Water	ALS: 4 Non ALS: 0	No	X		
011	0958_MW142S		28/04/2021 02:31 PM	Water	ALS: 4 Non ALS: 0	No	X		
012	0958_MW141S		28/04/2021 02:54 PM	Water	ALS: 6 Non ALS: 0	No	X		



CHAIN OF CUSTODY

ALS COC#: 22111

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW124D	Clear Plastic Bottle - Natural	250 mL	00071020084206	Green	No	
001	0958_MW124D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018930	Purple	No	
001	0958_MW124D	HDPE (no PTFE)	20 mL	00352010070609	Grey	No	
001	0958_MW124D	HDPE (no PTFE)	20 mL	00352010070690	Grey	No	
002	0958_MW122S	Clear Plastic Bottle - Natural	250 mL	00071020084220	Green	No	
002	0958_MW122S	HDPE (no PTFE)	20 mL	00352010070535	Grey	No	
002	0958_MW122S	HDPE (no PTFE)	20 mL	00352010070744	Grey	No	
003	0958_MW123I	Clear Plastic Bottle - Natural	250 mL	00071020084266	Green	No	
003	0958_MW123I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018167	Purple	No	
003	0958_MW123I	HDPE (no PTFE)	20 mL	00352010070499	Grey	No	
003	0958_MW123I	HDPE (no PTFE)	20 mL	00352010070635	Grey	No	
004	0958_MW121D	Clear Plastic Bottle - Natural	250 mL	00071020084261	Green	No	
004	0958_MW121D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019038	Purple	No	
004	0958_MW121D	HDPE (no PTFE)	20 mL	00352010070790	Grey	No	
004	0958_MW121D	HDPE (no PTFE)	20 mL	00352010070775	Grey	No	
005	0958_MW120I	Clear Plastic Bottle - Natural	250 mL	00071020084177	Green	No	
005	0958_MW120I	HDPE (no PTFE)	20 mL	00352010070607	Grey	No	
005	0958_MW120I	HDPE (no PTFE)	20 mL	00352010070538	Grey	No	
005	0958_MW120I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018907	Purple	No	
006	0958_QC106	Clear Plastic Bottle - Natural	250 mL	00071020084202	Green	No	
006	0958_QC106	HDPE (no PTFE)	20 mL	00352010070778	Grey	No	
006	0958_QC106	HDPE (no PTFE)	20 mL	00352010070781	Grey	No	
006	0958_QC106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018496	Purple	No	
007	0958_MW119S	Clear Plastic Bottle - Natural	250 mL	00071020084182	Green	No	
007	0958_MW119S	HDPE (no PTFE)	20 mL	00352010070501	Grey	No	
007	0958_MW119S	HDPE (no PTFE)	20 mL	00352010070602	Grey	No	

Wednesday, April 28, 2021

9:50:24 PM



CHAIN OF CUSTODY

COC#: 22111

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: AGDEF19009/Gingin - GW Template

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

007	0958_MW119S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018331	Purple	No	
008	0958_MW118D	Clear Plastic Bottle - Natural	250 mL	00071020084264	Green	No	
008	0958_MW118D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018838	Purple	No	
008	0958_MW118D	HDPE (no PTFE)	20 mL	00352010070669	Grey	No	
008	0958_MW118D	HDPE (no PTFE)	20 mL	00352010070662	Grey	No	
008	0958_MW118D	HDPE (no PTFE)	20 mL	00350019164040	Grey	No	
008	0958_MW118D	HDPE (no PTFE)	20 mL	00350019164242	Grey	No	
009	0958_MW117I	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018486	Purple	No	
009	0958_MW117I	Clear Plastic Bottle - Natural	250 mL	00071020084247	Green	No	
009	0958_MW117I	HDPE (no PTFE)	20 mL	00352010070574	Grey	No	
010	0958_MW116S	HDPE (no PTFE)	20 mL	00352010070614	Grey	No	
010	0958_MW116S	Clear Plastic Bottle - Natural	250 mL	00071020084226	Green	No	
010	0958_MW116S	HDPE (no PTFE)	20 mL	00351402043517	Grey	No	
010	0958_MW116S	HDPE (no PTFE)	20 mL	00352010070762	Grey	No	
011	0958_MW142S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018973	Purple	No	
011	0958_MW142S	Clear Plastic Bottle - Natural	250 mL	00071020084227	Green	No	
011	0958_MW142S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019034	Purple	No	
011	0958_MW142S	HDPE (no PTFE)	20 mL	00352010070597	Grey	No	
012	0958_MW141S	HDPE (no PTFE)	20 mL	00352010070540	Grey	No	
012	0958_MW141S	Clear Plastic Bottle - Natural	250 mL	00071020084237	Green	No	
012	0958_MW141S	HDPE (no PTFE)	20 mL	00350019163951	Grey	No	
012	0958_MW141S	HDPE (no PTFE)	20 mL	00352010070671	Grey	No	
012	0958_MW141S	HDPE (no PTFE)	20 mL	00352010070758	Grey	No	
012	0958_MW141S	HDPE (no PTFE)	20 mL	00350019164112	Grey	No	
012	0958_MW141S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019026	Purple	No	
Total Bottle Count: ALS: 51, Non ALS: 0							

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2104964

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : [REDACTED]</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : [REDACTED]@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0958_PFASOMP</p> <p>Order number : DEF19009/330</p> <p>C-O-C number : 22363</p> <p>Site : DEF19009/Gingin</p> <p>Sampler : [REDACTED]</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : [REDACTED]</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : [REDACTED]@alsglobal.com</p> <p>Telephone : [REDACTED]</p> <p>Facsimile : [REDACTED]</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 05-May-2021 10:20	Issue Date : 05-May-2021
Client Requested Due : 13-May-2021	Scheduled Reporting Date : 13-May-2021
Date	

Delivery Details

Mode of Delivery : Client Drop Off	Security Seal : Not Available
No. of coolers/boxes : 1	Temperature : 2.0 - Ice present
Receipt Detail :	No. of samples received / analysed : 3 / 3

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2104964-001	05-May-2021 08:47	0958_MW403_210505	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2104964-001	05-May-2021 08:47	0958_MW403_210505	✓
EP2104964-002	05-May-2021 08:49	0958_QC301_210505	✓
EP2104964-003	05-May-2021 08:49	0958_QC401_210505	✓

Proactive Holding Time Report

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

Requested Deliverables

- A4 - AU Tax Invoice (INV)

Email

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)

Email

- *AU Certificate of Analysis - NATA (COA)

Email

- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)

Email

- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)

Email

- A4 - AU Sample Receipt Notification - Environmental HT (SRN)

Email

- Chain of Custody (CoC) (COC)

Email

- EDI Format - ESDAT (ESDAT)

Email

- EDI Format - XTab (XTAB)

Email

cardno.com.au

cardno.com.au

cardno.com.au

cardno.com.au

cardno.com.au

cardno.com.au

cardno.com.au

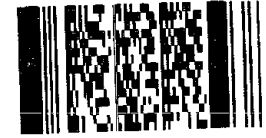


ALSCompass

SAMPLING *Intelligence*



Environmental Division
Perth
Work Order Reference
EP2104964



Telephone : --61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: WA-0958-PFASOMD Client: Cardno Project Manager: [REDACTED]
ALS Compass COC Reference: 22363 # Samples: 3 Phone: [REDACTED]
Sampler: [REDACTED]
Phone: [REDACTED]

Turnaround Requirements: Standard _____

Special Instructions:

Custody:

Relinquished by: <u>[REDACTED]</u>	Received by: <u>[REDACTED]</u>	Relinquished by:	Received by:
Date / Time: <u>5/5/21</u>	Date / Time: <u>5/5/21</u> <u>1020</u>	Date / Time:	Date / Time:



CHAIN OF CUSTODY

COC#: 22363

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes

No

N/A

Free ice / frozen ice bricks present upon receipt?

Yes

No

N/A

Random Sample Temperature on Receipt:

2.0

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW403		05/05/2021 08:47 AM	Water	ALS: 4 Non ALS: 0	No	X			Please split green bottle to have enough sample volume for lab QC
002	0958_QC301		05/05/2021 08:49 AM	Water	ALS: 2 Non ALS: 0	No		X		
003	0958_QC401		05/05/2021 08:49 AM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

COC#: 22363

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFASOMP

SITE: DEF19009/Gingin - GW

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW403	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049185	Purple	No	
001	0958_MW403	HDPE (no PTFE)	20 mL	00352005020451	Grey	No	
001	0958_MW403	HDPE (no PTFE)	20 mL	00352005020557	Grey	No	
001	0958_MW403	Clear Plastic Bottle - Natural	250 mL	00071020214445	Green	No	
002	0958_QC301	HDPE (no PTFE)	20 mL	00352005020570	Grey	No	
002	0958_QC301	HDPE (no PTFE)	20 mL	00352005020378	Grey	No	
003	0958_QC401	HDPE (no PTFE)	20 mL	00352005020535	Grey	No	
003	0958_QC401	HDPE (no PTFE)	20 mL	00352005020392	Grey	No	

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

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2104964	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 05-May-2021
Site	: DEF19009/Gingin	Issue Date	: 14-May-2021
Sampler	: [REDACTED]	No. of samples received	: 3
Order number	: DEF19009/330	No. of samples analysed	: 3

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
Container / Client Sample ID(s)						
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0958_MW403_210505	----	----	----	12-May-2021	05-May-2021	7

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Method					
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	20	5.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Container / Client Sample ID(s)							
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0958_MW403_210505	05-May-2021	----	----	----	12-May-2021	05-May-2021	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0958_MW403_210505	05-May-2021	----	----	----	12-May-2021	12-May-2021	✔
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0958_MW403_210505	05-May-2021	----	----	----	12-May-2021	12-May-2021	✔
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0958_MW403_210505	05-May-2021	----	----	----	12-May-2021	19-May-2021	✔
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
0958_MW403_210505	05-May-2021	----	----	----	07-May-2021	02-Jun-2021	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0958_MW403_210505	05-May-2021	----	----	----	07-May-2021	02-Jun-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) 0958_MW403_210505	05-May-2021	----	----	----	06-May-2021	12-May-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002) 0958_MW403_210505	05-May-2021	----	----	----	05-May-2021	02-Jun-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0958_MW403_210505, 0958_QC401_210505	0958_QC301_210505, 05-May-2021	13-May-2021	01-Nov-2021	✓	13-May-2021	01-Nov-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) 0958_MW403_210505, 0958_QC401_210505	0958_QC301_210505, 05-May-2021	13-May-2021	01-Nov-2021	✓	13-May-2021	01-Nov-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) 0958_MW403_210505, 0958_QC401_210505	0958_QC301_210505, 05-May-2021	13-May-2021	01-Nov-2021	✓	13-May-2021	01-Nov-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0958_MW403_210505, 0958_QC401_210505	0958_QC301_210505, 05-May-2021	13-May-2021	01-Nov-2021	✓	13-May-2021	01-Nov-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) 0958_MW403_210505, 0958_QC401_210505	0958_QC301_210505, 05-May-2021	13-May-2021	01-Nov-2021	✓	13-May-2021	01-Nov-2021	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	11	9.09	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

QUALITY CONTROL REPORT

Work Order	: EP2104964	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 05-May-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 05-May-2021
C-O-C number	: 22363	Issue Date	: 14-May-2021
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		



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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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

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

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

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

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3673250)									
EP2104998-010	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.22	8.22	0.0	0% - 20%
EP2104961-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	5.01	4.81	4.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3672419)									
EP2104964-001	0958_MW403_210505	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	182	182	0.5	0% - 50%
EP2105095-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	335000	334000	0.3	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3672420)									
EP2104964-001	0958_MW403_210505	EA025H: Suspended Solids (SS)	----	5	mg/L	11	9	17.3	No Limit
EP2105223-011	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3673248)									
EP2104967-009	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	323	326	0.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	323	326	0.7	0% - 20%
EP2104961-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3660943)									
EP2104650-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
EP2104650-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	110	110	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3660944)									
EP2104650-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	206	207	0.532	0% - 20%
EP2104650-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	54	55	2.44	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3662319)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED093F: Dissolved Major Cations (QC Lot: 3662319) - continued									
EP2104942-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	90	94	5.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	<1	<1	0.0	No Limit
EP2104943-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	16	16	0.0	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	3	3	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	65	66	1.9	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3659924)									
EP2104691-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	1	0.00	No Limit
EP2104727-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	5	4	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3673755)									
EP2104964-001	0958_MW403_210505	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3673755)									
EP2104964-001	0958_MW403_210505	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3673755)									
EP2104964-001	0958_MW403_210505	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Page : 4 of 7
 Work Order : EP2104964
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3673755) - continued									
EP2104964-001	0958_MW403_210505	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3673755)									
EP2104964-001	0958_MW403_210505	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3673755)									
EP2104964-001	0958_MW403_210505	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3673250)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3672419)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	103	88.1	114
				<10	1000 mg/L	99.9	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3672420)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	102	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3673248)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	95.8	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3660943)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	105	87.7	113
				<1	500 mg/L	98.1	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3660944)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	103	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3662319)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.4	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.1	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	103	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3659924)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	100	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3673755)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	86.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	91.8	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	91.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	89.4	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3673755) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	75.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	97.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3673755)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	84.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	99.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	96.4	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	105	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	97.0	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	102	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	110	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	96.0	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	98.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3673755)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	105	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	91.4	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	89.3	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	96.8	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	98.0	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	91.4	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	92.6	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3673755)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	89.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	93.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	116	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	96.6	71.4	144

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High



Sub-Matrix: WATER

Laboratory sample IDSample IDMethod: CompoundCAS Number				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3660943)							
EP2104650-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	20 mg/L	108	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3660944)							
EP2104650-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	98.8	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3659924)							
EP2104725-007	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	105	70.0	130

CERTIFICATE OF ANALYSIS

Work Order : **EP2104964**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 22363
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 3
No. of samples analysed : 3

Page : 1 of 8
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 05-May-2021 10:20
Date Analysis Commenced : 05-May-2021
Issue Date : 14-May-2021 16:55



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Inorganics Analyst	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

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

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



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0958_MW403_210505	----	----	----	----
Sampling date / time				05-May-2021 08:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2104964-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.30	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	182	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	11	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	3	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	3	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	19	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	77	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1	----	----	----	----
Magnesium	7439-95-4	1	mg/L	6	----	----	----	----
Sodium	7440-23-5	1	mg/L	57	----	----	----	----
Potassium	7440-09-7	1	mg/L	2	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	2.63	----	----	----	----
∅ Total Cations	----	0.01	meq/L	3.07	----	----	----	----
∅ Ionic Balance	----	0.01	%	7.83	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0958_MW403_210505

Sampling date / time

05-May-2021 08:47

Compound

CAS Number

LOR

Unit

EP2104964-001

Result

EP231A: Perfluoroalkyl Sulfonic Acids - Continued

Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0958_MW403_210505	----	----	----	----
Sampling date / time				05-May-2021 08:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2104964-001	-----	-----	-----	-----
Result				----	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	103	----	----	----	----
13C8-PFOA	----	0.02	%	98.6	----	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_QC301_210505	0958_QC401_210505	----	----	----
Sampling date / time				05-May-2021 08:49	05-May-2021 08:49	----	----	----
Compound	CAS Number	LOR	Unit	EP2104964-002	EP2104964-003	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_QC301_210505	0958_QC401_210505	----	----	----
Sampling date / time				05-May-2021 08:49	05-May-2021 08:49	----	----	----
Compound	CAS Number	LOR	Unit	EP2104964-002	EP2104964-003	-----	-----	-----
				Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	98.6	101	----	----	----
13C8-PFOA	----	0.02	%	97.9	101	----	----	----



Surrogate Control Limits

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

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

- (WATER) EP231A: Perfluoroalkyl Sulfonic Acids
- (WATER) EP231B: Perfluoroalkyl Carboxylic Acids
- (WATER) EP231C: Perfluoroalkyl Sulfonamides
- (WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids
- (WATER) EP231P: PFAS Sums
- (WATER) EP231S: PFAS Surrogate

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Monitoring Date	Specific Site	Monitoring Location	Sample_ID	Screen Interval	TOC	Well Depth		SWL (mbTOC)	RWL (mAHD)	Other Observations on Bore/Site	Sampling Method	Reading time	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	QC Dup Sample #	Odour	Colour
					(mAHD)	(m)															
28/04/2021	GinGin/Former Fuel Farm	MW101I	0958_MW101I_210428	19.78-22.78	73.5	23.5	12.401	61.099			Hydrasleeve	10:26	21	0.89	119.1	77.35	6.39	-62			Clear
28/04/2021	GinGin/Former Fuel Farm	MW102D	0958_MW102D_210428	40.02-43.02	73.41	43.4	12.47	60.94			Hydrasleeve	09:34	21	1.05	523.3	339.95	7.96	107	QC104/204		Clear
28/04/2021	GinGin/Fire House and Refuelling Area	MW104I	0958_MW104I_210428	19.5-22.9	73.74	22.9	12.45	61.29			Hydrasleeve	10:33	24.8	1.17	125.7	126.3	8.02	5.8	QC105/205	Slight sulfur	Clear, Yellow
28/04/2021	GinGin/Fire House and Refuelling Area	MW105D	0958_MW105D_210428	39-42.5	73.79	42.3	12.543	61.247			Hydrasleeve	10:05	23.2	1.72	240.5	156	9.62	-1.2			Clear
27/04/2021	GinGin/Primary Landfill	MW106S	0958_MW106S_210427	6.8-10.8	71.54	11	7.18	64.36			Hydrasleeve	15:09	21.6	1.81	272	176.15	3.41	329.7			Brown
28/04/2021	GinGin/Primary Landfill	MW107S		5.5-9.5	71.6	9.5				Dry		12:54									
28/04/2021	GinGin/Primary Landfill	MW108S		5.0-9.0	70.9	9				Dry		12:56									
28/04/2021	GinGin/Secondary Landfill	MW109S	0958_MW109S_210428	5.8-10.3	73.45	10.3	9.15	64.3			Hydrasleeve	11:53	22.9	1.3	127.6	83.2	4.68	163.9			Clear
28/04/2021	GinGin/Secondary Landfill	MW110S	0958_MW110S_210428	6.5-10.0	73.74	10	9.15	64.59			Hydrasleeve	12:14	22	2.3	109.2	70.85	4.66	219.2			Brown
28/04/2021	GinGin/Fire Equipment Testing - Eastern Leach Field	MW111S								Dry		12:56									
28/04/2021	GinGin/Fire Equipment Testing - Former Fuel Farm	MW112S	0958_MW112S_210428	7.5-10.5	73.69	10.5	8.79	64.9		Mislabelled MW136 on CoC	Hydrasleeve	11:40	22.9	9.39	177.5	115.7	3.83	319.3			Clear
28/04/2021	GinGin/Fire Equipment Testing - Former Fuel Farm	MW113S	0958_MW113S_210428	6.5-9.5	73.79	9.6	9.185	64.605			Hydrasleeve	11:18	22.1	1.35	133.5	87.1	4.03	303.9			Clear
28/04/2021	GinGin/Sewerage System - Western Leach Field	MW114S		5.0-8.0	73.68	8				dry		11:04									
28/04/2021	GinGin/Site Drainage - East of Runway	MW115S	0958_MW115S_210428	5.0-8.0	70.79	8	6.17	64.62			Hydrasleeve	13:01	23.7	1.11	136.2	88.4	4.03	272.7			Brown
28/04/2021	GinGin/Inner Perimeter	MW116S	0958_MW116S_210428	8.0-11.0	74.43	11	10.18	64.25			Hydrasleeve	12:31	21	2.26	150.4	97.5	3.99	273.3			Brown
28/04/2021	GinGin/Inner Perimeter	MW117I	0958_MW117I_210428	21.3-23.3	74.19	23	14.1	60.09			Hydrasleeve	12:08	21	1.83	129.1	83.85	5.18	33.7			Green
28/04/2021	GinGin/Inner Perimeter	MW118D	0958_MW118D_210428	41-43	74.19	43	14.17	60.02			Hydrasleeve	11:56	21.3	1.3	212.5	137.8	5.01	4.8			Clear
28/04/2021	GinGin/Inner Perimeter	MW119S	0958_MW119S_210428	10.1-13.1	74.06	13.1	12.49	61.57			Hydrasleeve	11:37	22.2	2.55	126.2	81.9	4.1	320.2			Brown
28/04/2021	GinGin/Inner Perimeter	MW120I	0958_MW120I_210428	19.94-22.94	73.84	23	15.19	58.65			Hydrasleeve	10:56	23	2.86	100	65	5.22	108.4	QC106/206		Brown
28/04/2021	GinGin/Inner Perimeter	MW121D	0958_MW121D_210428	39.8-42.8	73.96	42.8	15.34	58.62			Hydrasleeve	10:32	22.9	3.1	162	105.3	5.94	-44.8			Clear
28/04/2021	GinGin/Inner Perimeter	MW122S	0958_MW122S_210428	10.5-13.5	75.84	13.5	13.27	62.57		Insufficient volume for total collection	Hydrasleeve	10:03	-	4.78	158.9	103.25	4.42	293.5			Clear
28/04/2021	GinGin/Inner Perimeter	MW123I	0958_MW123I_210428	20-23	76.03	23	16.36	59.67			Hydrasleeve	10:12	22	1.7	188.2	122.2	5.47	-41.5		Sulfuric	Brown
28/04/2021	GinGin/Inner Perimeter	MW124D	0958_MW124D_210428	39.5-42.5	75.87	42.5	16.83	59.04			Hydrasleeve	09:47	20.9	0.52	413.1	267.8	6.02	47.3			Clear
27/04/2021	GinGin/Site Boundary	MW125S	0958_MW125S_210427	14.25-17.25	74.88	18	15.03	59.85			Hydrasleeve	14:45	21	1.38	126.2	81.9	4.99	37.2			Brown
27/04/2021	GinGin/Site Boundary	MW126I	0958_MW126I_210427	33.5-36.5	73.5	36.5	13.45	60.05			Hydrasleeve	14:24	22.4	1.41	203.7	132.6	5.3	-2.5			Clear
27/04/2021	GinGin/Site Boundary	MW128S	0958_MW128S_210427	47-50	74.4	50	17.02	57.38			Hydrasleeve	14:15	21.4	0.56	214.5	139.75	4.82	129.5			Brown
27/04/2021	GinGin/Site Boundary	MW129I	0958_MW129I_210427	15.3-18.3	73.51	18	16.1	57.41			Hydrasleeve	13:41	24.1	1.96	115	74.75	5.44	-23.7	QC103/203		Clear
27/04/2021	GinGin/Site Boundary	MW130D	0958_MW130D_210427	33.5-36.5	72.77	36.5	15.65	57.12			Hydrasleeve	13:30	21.8	1.21	229.3	148.85	5.73	-48.9		Foul	Black
27/04/2021	GinGin/Site Boundary	MW131S	0958_MW131D_210427	52.5-55.5	76.59	55.5	19.56	57.03			Hydrasleeve	12:51	23.3	1.19	203.5	132.5	5.48	-26.9			Clear
27/04/2021	GinGin/Site Boundary	MW132I	0958_MW132I_210427	18.5-21.5	76.43	21	19.25	57.18			Hydrasleeve	13:02	21.5	0.73	164.6	107.25	5.05	27.7			Clear
27/04/2021	GinGin/Site Boundary	MW133D	0958_MW133D_210427	40.9-43.9	76.49	43.5	19.65	56.84			Hydrasleeve	12:34	25.3	1.51	160.8	104.65	5.54	-5			Clear
27/04/2021	GinGin/Site Boundary	MW134D		53-56	78.48	56				Dry	Hydrasleeve	11:49									
27/04/2021	GinGin/Site Boundary	MW135I	0958_MW135I_210427	21.1-23.6	77.67	24	21.05	56.62			Hydrasleeve	11:21	20.2	1.71	226.7	147.55	4.98	35.8			Brown
27/04/2021	GinGin/Site Boundary	MW136D	0958_MW136D_210427	41-44	78.24	44.9	21.57	56.67			Hydrasleeve	11:31	21.2	3.37	190.9	124.5	5.51	-17.9			Clear
28/04/2021	GinGin/Background Well	MW137S	0958_MW137S_210428		73.12	8.7	8.82	64.3			Hydrasleeve	13:24	24.1	3.25	216.6	141.05	4.59	172.7			Brown
27/04/2021	GinGin/	MW138S	0958_MW138S_210427	9.0-15.0	74.17	15	9.2	64.97			Hydrasleeve	10:35	22.6	1.44	323.5	210.6	4.47	231.9	Qc102/Qc202		Brown
27/04/2021	GinGin/	MW139I	0958_MW139I_210427	27.0-30.0	73.99	30	14.1	59.89			Hydrasleeve	10:17	22.5	0.92	226.9	147.55	6.33	36			Clear
27/04/2021	GinGin/	MW140D	0958_MW140D_210427	51.5-54.5	73.9	54	13.95	59.95			Hydrasleeve	10:00	20.4	0.79	676	442	6.99	-46.4			Clear
28/04/2021	GinGin/Off-Site Monitoring Well	MW141S	0958_MW141S_210428	13.5-16.5	74.36	16.5	11.2	63.16			Hydrasleeve	14:45	22.2	1.69	188.4	122.85	4.01	67.4		Slight odour	Brown
28/04/2021	GinGin/Off-Site Monitoring Well	MW142S	0958_MW142S_210428	12.4-15.4	76.34	15.5	14.35	61.99			Hydrasleeve	14:40	26.5	4.02	289	187.85	3.64	337			Brown
28/04/2021	GinGin/Off-Site Monitoring Well	MW143S		14-18.5	75.81					Dry	Hydrasleeve	14:25									
28/04/2021	GinGin/Former Fuel Farm	MW301	0958_MW301_210428	7_10	74.547	10	9.31	65.237			Hydrasleeve	10:57	22.2	4.46	227.7	148.2	3.61	302.6			Clear
28/04/2021	GinGin/Former Fuel Farm	MW302	0958_MW302_210428	7_10	74.712	10	9.48	65.232			Hydrasleeve	10:42	22.3	4.76	141	91.65	4.02	194.4			Clear
28/04/2021	GinGin/Former Fuel Farm	MW303	0958_MW303_210428	7_10	74.574	10	9.34	65.234			Hydrasleeve	10:51	22.3	4.06	149.5	96.85	3.94	268.5			Clear
28/04/2021	GinGin/Fire House and Refuelling Area	MW304		6.5-9.5	74.094					DRY		11:20									
28/04/2021	GinGin/Fire House and Refuelling Area	MW305		6.0-9.0	73.885	9				Dry		11:16									
28/04/2021	GinGin/Fire House and Refuelling Area	MW306		6.0-9.0	73.965	9				Dry		11:12									
28/04/2021	GinGin/Power House	MW307	0958_MW307_210428	5.5-8.5	73.635	8.5	8.125	65.51			Hydrasleeve	11:55	24.4	2.5	158.4	102.7	5.13	179.5	QC107/207		Cloudy, Brown
28/04/2021	GinGin/Power House	MW308		6-9	73.6913	9				Dry		11:30									
28/04/2021	GinGin/Power House	MW309	0958_MW309_210428	6.5-9.5	73.8988	9.5				Dry		11:40									
28/04/2021	GinGin/Power House	MW310	0958_MW310_210428	6-9	73.8057	9	8.25	65.556			Hydrasleeve	11:31	25.9	2.11	154.2	100.1	6.85	113			Cloudy
28/04/2021	GinGin/Base Water Supply Infrastructure	MW312	0958_MW312_210428	6.5-9.5	74.5413	9.5	9.035	65.506			Hydrasleeve	12:35	24.4	1.07	165.4	107.25	5.76	116.8			Cloudy, Yellow
28/04/2021	GinGin/Base Water Supply Infrastructure	MW313	0958_MW313_210428	7.5-10.5	74.6882	10.5	9.18	65.508			Hydrasleeve	12:26	24.3	1.42	162.2	105.3	5.52	139.4			Cloudy
27/04/2021	GinGin/Base Fire Water Supply Infrastructure	MW401	0958_MW401_210427	NA	NA	NA					Tap	11:29	30.5	1.37	141.3	91.65	6.23	-52.5			Clear, Yellow
27/04/2021	GinGin/Base Water Supply Infrastructure	MW402	0958_MW402_210427	NA	NA	NA					Tap	11:05	25.2	1.21	380.4	247.65	5.98	140.2	101/201	Organic	Clear
5/05/2021	GinGin/Off-Site Monitoring Well	MW403	0958_MW403_210505	14.0-26.0	73.84	26					Hydrasleeve	8:39	18	1.63	422.7		7.2	83.8			Clear
28/04/2021	GinGin/Unknown	MW504	0958_MW504_210428	10.0-13.0	72.82	13	7.908	64.912			Hydrasleeve	09:47	23.8	1.27	61	39.65	5.8	130.1			Cloudy, Brown
28/04/2021	GinGin/Unknown	MW505	0958_MW505_210428	10_13	73.832	13	8.915	64.917			Hydrasleeve	12:51	24.5	0.81	158.4	102.7	5.65	218.2			Clear
27/04/2021	GinGin/Base Water Supply Infrastructure	POT101	0958_POT101_210427								Tap	11:46	26.3	3.47	275.5	179.4	6.41	22.3			Clear

Equipment Calibration Report

Equipment Report – YSI ProPlus

This YSI ProPlus Water Quality Meter (Unit) has been performance checked as per the manufacture's guidelines¹. **196102400**

The Unit has been checked for and comprises of the following items:

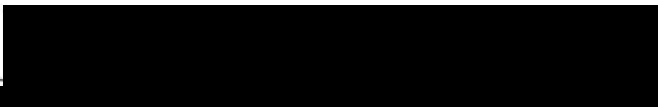
Item Present	Item
☐	2 x 12V Batteries
☐	Screw Driver
☐	YSI Cup
☐	Flow Cell
☐	Probe cover for SW sampling

The following tests and operational checks have been conducted on the Unit:

Test Completed	Test Passed	Item
☐	☐	WQM Unit Cleaned & Decontaminated using Decon 90
☐	☐	Operations check (screen functions)
☐	☐	Battery Voltage <7.2 V (_____ V)

The Unit has been performance checked and calibrated as follows:

Parameter	Calibration Solution Values	Calibrated Values
Dissolved Oxygen	100% Saturation in Air	
	0.00% (Na ₂ SO ₄ solution)	0.0 % 96.8%
Conductivity	3500 and 1413 2,780 µS/cm	1413
pH	4.00 pH units	4.0 7.0
	7.00 pH units	7.01

Checked / Calibrated by: 

Signed: 

Date: **27/4/21**

¹ Professional Plus YSI User Manual, Published 2009

Equipment Calibration Report

Equipment Report – YSI ProPlus

This YSI ProPlus Water Quality Meter (*Unit*) has been performance checked as per the manufacture's guidelines¹. **200102897**

The Unit has been checked for and comprises of the following items:

Item Present	Item
☐	2 x 12V Batteries
☐	Screw Driver
☐	YSI Cup
☐	Flow Cell
☐	Probe cover for SW sampling

The following tests and operational checks have been conducted on the Unit:

Test Completed	Test Passed	Item
☐	☐	WQM Unit Cleaned & Decontaminated using Decon 90
☐	☐	Operations check (screen functions)
☐	☐	Battery Voltage <7.2 V (_____ V)

The Unit has been performance checked and calibrated as follows:

Parameter	Calibration Solution Values	Calibrated Values
Dissolved Oxygen	100% Saturation in Air	99.8%
	0.00% (Na ₂ SO ₄ solution)	0.0
Conductivity	1413 and 35000 μ S/cm	1416 32859
pH	4.00 pH units	4.01
	7.00 pH units	6.98

Checked / Calibrated by: _____

Signed: _____

Date: **21/4/21**

¹ Professional Plus YSI User Manual, Published 2009

Equipment Calibration Report

Equipment Report – YSI ProPlus

This YSI ProPlus Water Quality Meter (Unit) has been performance checked as per the manufacture's guidelines¹. *20J100956*

The Unit has been checked for and comprises of the following items:

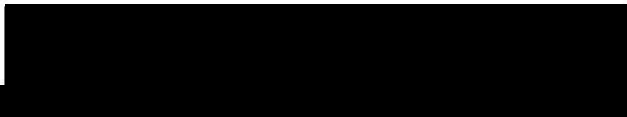
Item Present	Item
☐	2 x 12V Batteries
☐	Screw Driver
☐	YSI Cup
☐	Flow Cell
☐	Probe cover for SW sampling

The following tests and operational checks have been conducted on the Unit:

Test Completed	Test Passed	Item
☐	☐	WQM Unit Cleaned & Decontaminated using Decon 90
☐	☐	Operations check (screen functions)
☐	☐	Battery Voltage <7.2 V (_____ V)

The Unit has been performance checked and calibrated as follows:

Parameter	Calibration Solution Values	Calibrated Values
Dissolved Oxygen	100% Saturation in Air	<i>102%</i>
	0.00% (Na ₂ SO ₄ solution)	<i>0.0%</i>
Conductivity	<i>1413 and 3500</i> 2,000 µS/cm	<i>415</i> 3226
pH	4.00 pH units	<i>4.02</i>
	7.00 pH units	<i>6.96</i>

Checked / Calibrated by: 

Signed: 

Date: *27/4/21*

¹ Professional Plus YSI User Manual, Published 2009



Calibration Report

Multi-Parameter Water Quality Instrument

Customer:

Contact:

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 20D102897

Cable length: 4m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range	0 mV ± 50 mV	✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	173.80 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 58.55
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV 2 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µS/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Parameter	Standards	Reference	Calibration Point	Span	Units	Instrument Readings		
						Before	After	Units
Temperature	Check Temp NATA	Room Temp	19.6	-0.2	°C	NA	19.4	°C
pH	pH 7.00	356684	7.01	-26.80	mV	7.02	7.01	pH
pH	pH 4.00	355385	4.00	147.00	mV	4	4.00	pH
Conductivity	2764 µS/cm at 25°C	20/1007	2764	GLP	5.04	2739	2764	µS/cm
ORP (Reference check only)	Zobell A & B	20/0506	241	241	mV	237.2	239.3	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	0.3	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	5.13	uA	97.7	100.0	%

Calibrated by:

Calibration Date: 02-May-21

Next Due: 29-Oct-21

Date of Bump Test	Project ID	Unit Brand/Model	Ambient Air Oxygen Calibration	Zero Oxygen Solution Calibration	Standard Concentrations	Ambient Temperature (°C)	Bump Test Reading	Bump Test Readings within ±5%?	Comment	Test by (Name)	(Signature)
28-4-21	0958	YSI #1942 02400	100% Saturation? ☒ Y	0% Calibration? ☒ Y	pH 4.00 ☒ Y / N pH 7.00 ☒ Y / N EC: 1,413µS/cm ☒ Y / N	17.6	pH 4.00: 4.07 pH 7.00: 6.97 Temp: 17.8 EC: 1224	pH 4.00: (± pH 0.2) ☒ Y / N pH 7.00: (± pH 0.2) ☒ Y / N Temp: (± 2°C) ☒ Y / N EC: (± 150µS/cm) ☒ Y / N			
28-4-21	0958	YSI #200102 897	100% Saturation? ☒ Y	0% Calibration? ☒ Y	pH 4.00 ☒ Y / N pH 7.00 ☒ Y / N EC: 1,413µS/cm ☒ Y / N	17.8	pH 4.00: 4.08 pH 7.00: 7.06 Temp: 17.9 EC: 1218	pH 4.00: (± pH 0.2) ☒ Y / N pH 7.00: (± pH 0.2) ☒ Y / N Temp: (± 2°C) ☒ Y / N EC: (± 150µS/cm) ☒ Y / N			
		YSI #	100% Saturation? Y	0% Calibration? Y	pH 4.00 Y / N pH 7.00 Y / N EC: 1,413µS/cm Y / N		pH 4.00: pH 7.00: Temp: EC:	pH 4.00: (± pH 0.2) Y / N pH 7.00: (± pH 0.2) Y / N Temp: (± 2°C) Y / N EC: (± 150µS/cm) Y / N			
		YSI #	100% Saturation? Y	0% Calibration? Y	pH 4.00 Y / N pH 7.00 Y / N EC: 1,413µS/cm Y / N		pH 4.00: pH 7.00: Temp: EC:	pH 4.00: (± pH 0.2) Y / N pH 7.00: (± pH 0.2) Y / N Temp: (± 2°C) Y / N EC: (± 150µS/cm) Y / N			
		YSI #	100% Saturation? Y	0% Calibration? Y	pH 4.00 Y / N pH 7.00 Y / N EC: 1,413µS/cm Y / N		pH 4.00: pH 7.00: Temp: EC:	pH 4.00: (± pH 0.2) Y / N pH 7.00: (± pH 0.2) Y / N Temp: (± 2°C) Y / N EC: (± 150µS/cm) Y / N			
		YSI #	100% Saturation? Y	0% Calibration? Y	pH 4.00 Y / N pH 7.00 Y / N EC: 1,413µS/cm Y / N		pH 4.00: pH 7.00: Temp: EC:	pH 4.00: (± pH 0.2) Y / N pH 7.00: (± pH 0.2) Y / N Temp: (± 2°C) Y / N EC: (± 150µS/cm) Y / N			
		YSI #	100% Saturation? Y	0% Calibration? Y	pH 4.00 Y / N pH 7.00 Y / N EC: 1,413µS/cm Y / N		pH 4.00: pH 7.00: Temp: EC:	pH 4.00: (± pH 0.2) Y / N pH 7.00: (± pH 0.2) Y / N Temp: (± 2°C) Y / N EC: (± 150µS/cm) Y / N			
		YSI #	100% Saturation? Y	0% Calibration? Y	pH 4.00 Y / N pH 7.00 Y / N EC: 1,413µS/cm Y / N		pH 4.00: pH 7.00: Temp: EC:	pH 4.00: (± pH 0.2) Y / N pH 7.00: (± pH 0.2) Y / N Temp: (± 2°C) Y / N EC: (± 150µS/cm) Y / N			

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review

PFAS Ongoing Monitoring Plan Biannual Monitoring Factual Report

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
QA Documentation	
Project Quality Plan/Work Plan and Data Quality Objectives	<p>The field investigation was carried out on the 27 and 28 April and 5 May 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (ref DEF19009_Report03.0_Gingin Satellite Airfield_OMP PFAS_SAQP) issued to the client and in general compliance with the Australian standards AS 4482.1- 2005 “<i>Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds</i>”, Standards Australia 1998. AS/NZ 5667:1998 <i>Water quality – sampling</i> and NEPM “<i>National Environment Protection (Assessment of Site Contamination) Measure</i>”.</p> <p>A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the PFAS OMP Post-Summer 2021 Factual Report. In addition, a safety, health and environment work method statement (SHEWMS) was also prepared.</p> <p>The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.</p>
Data Representativeness	
Use of Composites	No Composites were used during the investigation
Holding Times	<p>Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes. with the exception of the following:</p> <ul style="list-style-type: none"> o pH – 9 days overdue • EP2104578, EP2104665 o pH – 6 days overdue (All samples) • EP2104577, o pH – 9 days overdue (All samples) • EP2104666, EP2104679 o pH – 7 days overdue (All samples) • EP2104964 <p>The holding time exceedances for pH are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.</p>
Background samples	MW137_S is located upgradient of the Site and provides background groundwater quality information.

QA/QC Aspects	Evidence & Evaluation															
Verification of field procedures	<p>The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP.</p> <p>None disposable equipment was decontaminated between sample locations.</p>															
Data Precision & Accuracy																
QC sample Frequency	<table><tr><th>QC sample type</th><th>SAQP required frequency</th><th>Sample Collected</th></tr><tr><td>Blind duplicate</td><td>1 in 10 primary samples (10%)</td><td>7 for 51 primary samples (13.0%)</td></tr><tr><td>Split duplicate</td><td>1 in 10 primary samples (10%)</td><td>7 for 51 primary samples (13.0%)</td></tr><tr><td>Rinsate</td><td>1 per dipper per day</td><td>6 for 3 days</td></tr><tr><td>Field Blank</td><td>1 per day</td><td>6 for 3 days</td></tr></table>	QC sample type	SAQP required frequency	Sample Collected	Blind duplicate	1 in 10 primary samples (10%)	7 for 51 primary samples (13.0%)	Split duplicate	1 in 10 primary samples (10%)	7 for 51 primary samples (13.0%)	Rinsate	1 per dipper per day	6 for 3 days	Field Blank	1 per day	6 for 3 days
	QC sample type	SAQP required frequency	Sample Collected													
	Blind duplicate	1 in 10 primary samples (10%)	7 for 51 primary samples (13.0%)													
	Split duplicate	1 in 10 primary samples (10%)	7 for 51 primary samples (13.0%)													
	Rinsate	1 per dipper per day	6 for 3 days													
Field Blank	1 per day	6 for 3 days														
Field duplicate and triplicate samples were collected at a rate of 13%; above the target frequency of 10%.																
QC Testing – Blind Replicates (Primary Lab)	<ul style="list-style-type: none">RPD Acceptance Criteria: <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <ul style="list-style-type: none">Groundwater Samples Analysed: 58 (including QC)Blind Replicate Samples Analysed: 7Number of Analyte Pairs Exceeding Criteria: 0 <p>All RPDs were within acceptable range.</p>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
QC Testing – Field Splits (Secondary Lab)	<ul style="list-style-type: none">RPD Acceptance Criteria: <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <ul style="list-style-type: none">Groundwater Samples Analysed: 58 (including QC)Field Split Samples Analysed: 7Number of Analyte Pairs Exceeding Criteria: 11 (3 samples) <p>The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference or methodologies between the primary and secondary laboratories.</p>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
Field Blanks	<p>Field Blanks were collected at a rate of one per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.</p>															
Laboratory Internal QC	<p>Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and satisfactory results for method blank, laboratory control samples and laboratory duplicates.</p> <p>All Matrix Spikes generally reported recoveries with the acceptance range of 70% to 130% with the exception of the following:</p> <ul style="list-style-type: none">EP2104665<ul style="list-style-type: none">PFHxS, PFHxA. Client Sample ID: MW307. MS recovery not determined, background level greater than or equal to 4x spike level.PFHpA. Client Sample ID: MW307. Limit: 72-130%, Actual: 49%.PFOA. Client Sample ID: MW307. Limit 71-133%. Actual: 47.6%.															

QA/QC Aspects	Evidence & Evaluation
	<ul style="list-style-type: none"> • EP2104666 <ul style="list-style-type: none"> o PFHxS, PFHxA. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. o PFDS. Client Sample ID: Anonymous. Recovery greater than upper quality data objective. Limit: 53-142%, Actual: 145%. o PFHpA. Client Sample ID: Anonymous. Recovery less than lower data quality objective. Limit: 72-130%, Actual: 49%. o PFHpA. Client Sample ID: Anonymous. Recovery greater than upper data quality objective. Limit: 72-130%, Actual: 132%. o PFOA. Client Sample ID: Anonymous. Recovery less than lower data quality objective. Limit: 71-133%, Actual: 47.6%. o PFOA. Client Sample ID: Anonymous. Recovery greater than upper data quality objective. Limit: 71-133%, Actual: 135%. • EP2104679 <ul style="list-style-type: none"> o PFDS. Client Sample ID: MW118D. Recovery greater than upper data quality objective. Limit: 53-142%, Actual: 145%. o PFHpA. Client Sample ID: MW118D. Recovery greater than upper data quality objective. Limit: 72-130%, Actual: 132%. o PFOA. Client Sample ID: MW118D. Recovery greater than upper data quality objective. Limit: 71-133%. Actual: 135%. <p>The following Quality Control sample frequency non-conformance was reported:</p> <ul style="list-style-type: none"> • EP2104577 <ul style="list-style-type: none"> o Laboratory Duplicates: expected rate: 10%, actual: 5.71%. o Matrix Spike: expected rate: 5%, actual: 2.86%. • EP2104665 <ul style="list-style-type: none"> o Laboratory Duplicates: expected rate: 10%, actual 5%. • EP2104666 <ul style="list-style-type: none"> o Laboratory Duplicates: expected rate: 10%, actual 5.13%. • EP2104679 <ul style="list-style-type: none"> o Laboratory Duplicates: expected rate: 10%, actual: 4.17%. o Matrix Spike: expected rate: 5%, actual: 4.17%.
Laboratory Method Detection Limit	Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.
NATA endorsement of laboratory reports	<p>Laboratory reports were stamped with the NATA endorsement stamp and signature.</p> <p>ALS Accreditation No. 825</p> <p>Eurofins Accreditation No. 1261</p>
Calibration of Field Equipment	<p>All equipment used during the investigation was calibrated by the supplier and daily reading of reference solutions (bump test) undertaken daily on the field prior to use.</p> <p>The equipment calibration certificates and bump tests records are provided in Appendix D.</p>
Decontamination and Equipment Blanks	Rinsate blanks were collected at a rate of one per day per sampler when reusable equipment is used. All rinsate samples tested reported analytes concentrations below the laboratory LORs.
Data Comparability	
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.

QA/QC Aspects	Evidence & Evaluation
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
Data Completeness	
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- ☐ A factual report of the condition of a portion of the site or one aspect of an entire site.
- ☐ Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- ☐ Validation of the success of remediation of a site or a portion of a site.
- ☐ Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide “environmental sign-off” of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants’ duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the “hot spot” method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

PFAS OMP Quarterly Sampling Event Factual Report

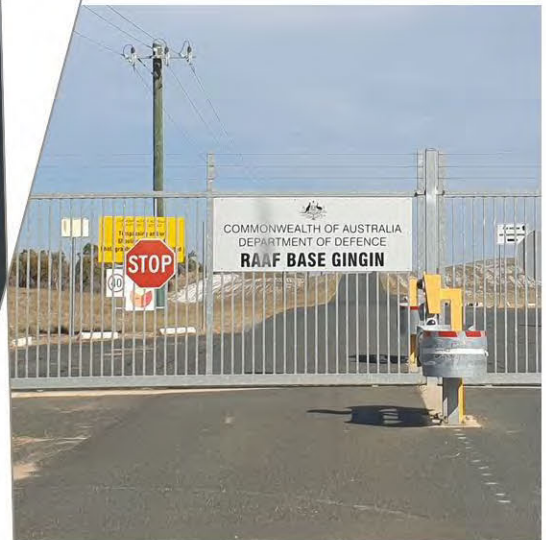
July 2021

Gingin Satellite Airfield

DEF19009

Prepared for
Department of Defence

23 August 2021



Contact Information

Cardno (WA) Pty Ltd

ABN 77 009 119 000

11 Harvest Terrace
West Perth WA 6005
Australia

www.cardno.com

Phone +61 8 9273 3888

Fax +61 8 9486 8664

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Job Reference DEF19009

Date 23 August 2021

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Senior Environmental Engineer
Principal / Regional WA Project Manager

Document History

Version	Effective Date	Description of Revision	Prepared by	Reviewed by
Rev 0	11/08/2021	Client Submission / Review		
Rev 1	23/08/2021	Final		

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Chemical Names

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

Technical Terms & Abbreviations

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

Units

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

Site Specific

OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) at Royal Australian Air force (RAAF) Gingin Satellite Airfield (“the site”). The site is located in Yeal, Western Australia and is displayed in Figure 1 of Appendix A.

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

- > Cardno, 15 June 2021, Reference: DEF19009, ‘PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) Gingin Satellite Airfield’.

The SAQP was reviewed prior to the sampling event and no changes related to the quarterly monitoring event were made.

For the purposes of this report:

- > Management Area was defined as Gingin Satellite Airfield (Figure 1, Appendix A).
- > Monitoring Area was defined as comprising the Site, plus the parcel of Crown Land that represents the Yeal Swamp Nature Reserve – an area that surrounds much of the southern, western and northern extent of the Base. The lateral extents of the Monitoring Area are aligned with the boundary of the adjoining Crown Lands property (Figure 1, Appendix A).

1.2 Purpose & Objectives

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

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

The objectives of the report are:

- > To provide a succinct summary of the July 2021 sampling event and provision of analytical results with supporting tables and figures.
- > To provide confirmation of the current understanding of risk.
- > To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

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

- > National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).
- > Heads of Environmental Protection Authority’s Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.
- > Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.
- > Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

- > Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites¹.
- > Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

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

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in general accordance with the SAQP (Cardno, 2021), applying methods set out in section 3 of this report. The groundwater bores monitored as part of the OMP quarterly monitoring event are presented in Table 2-1, and are shown on Figure 2, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
On-Site Abstraction wells	0958_MW401; 0958_MW402
Off-Site wells - South	0958_MW141S, 0958_MW142S; 0958_MW143S; 0958_MW403
Off-Site Abstraction wells ⁽¹⁾	Pinjar Production P140, Pinjar Production P145.

Note: (1) These are Water Corporation production bores being sampled by the Water Corporation.

2.2 Tap Water Monitoring

Water samples were collected from the tap water monitoring locations listed in Table 2-2 in accordance with the SAQP (Cardno, 2021) and sampling methodology detailed in section 3.2. The tap water monitoring locations are shown on Figure 2, Appendix A.

Table 2-2 Tap Water Monitoring Locations

Monitoring Area	Location ID
On-Site	0958_POT101; 0958_POT102; 0958_POT103; 0958_POT104; 0958_POT105.

2.3 Data Management

All the data included in this Factual Report has been collected, uploaded to the ESdat database and reviewed according to the data management requirements of the Defence Contamination Management Manual (DCMM) Annex L.

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

2.3.1 Defence ESdat database

Data collected as part of the July 2021 OMP quarterly monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- > All field data collected was uploaded;

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

- > Laboratory data was uploaded and approved; and
- > QA/QC data was reconciled.

2.4 Deviations from the OMP SAQP

The following deviations from the SAQP were reported:

- > Monitoring Bore MW143S was not sampled as this monitoring location was found dry.
- > The abstraction bore 2 (MW402) was not sampled (unable to unscrew the lid).

No other deviation from the SAQP was reported during the July 2021 quarterly sampling event.

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken by no purge HydraSleeve® method as detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Groundwater Field Parameters	<p>Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) were calibrated by the equipment supplier to optimise the accuracy of the measurements taken. Calibration certificates are provided in Appendix D.</p>
Deployment of HydraSleeve	<p>HydraSleeve were deployed with top weight sample collection to begin at the lowest point.</p>
Retrieval of HydraSleeves (Sample Collection)	<p>HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment. Samples were collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples were discharged immediately (minimise changes in chemistry) via discharge tube.</p> <p>Following sampling, hydrasleeves were deployed in preparation for the next OMP monitoring event using the same string for consistency between event (same depth of sampling i.e. within screen).</p>
Decontamination procedure	<p>Dedicated HydraSleeves were used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p>

Activity	Details
	Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	<p>Groundwater samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. <p>The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix C.</p>

3.2 Tap water Sampling Methodology

Water samples from abstraction bores and taps were collected via the 'first flush' sampling method. The primary objective of the 'first flush' sampling method is to collect water representative of the user, who may not purge the water line.

Field parameters (pH, temperature, EC, ORP and DO) were recorded post sampling collection via flow cell, samples were analysed for the same analytical suite as the groundwater monitoring wells.

3.3 Quality Control / Quality Assurance

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

- > QA documentation.
- > Bias.
- > Data Representativeness.
- > Data Precision & Accuracy.
- > Laboratory Performance.
- > Data Comparability.
- > Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E. The data quality review indicates no significant systematic errors in the data collection process for groundwater and tap water and therefore, the data set used as the basis for this assessment is considered valid and complete.

3.4 Assessment Criteria

3.4.1 Groundwater and Tap water

The adopted assessment criteria for groundwater and tap water are detailed in Table 3-2.

Table 3-2 Criteria for Groundwater and Tap water

Exposure Scenario	Adopted Assessment Criteria		
	PFHxS / PFOS µg/L	PFOA	Guidance
Human Health - Drinking Water Quality Guideline	0.07	0.56	HEPA 2020
Human Health – Recreational Use Guideline	2.0	10	HEPA 2020

4 Field Observations and Results

4.1 General Site Observations

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

4.2 Groundwater

4.2.1 Summary of Field Observations

4.2.1.1 Physicochemical parameters

Stabilised physicochemical parameters, water colour and turbidity observations recorded during the groundwater and tap water sampling event are presented in field sampling records, included in Appendix D. No visual or olfactory evidence of contamination was recorded.

Groundwater condition was fresh (TDS ranging from 100.75 mg/L to 224.9 mg/L), acidic (pH ranging 4.12 to 5.65). Groundwater temperature was on average 18.5°C, DO readings mostly indicate aerobic groundwater condition (DO ranging from 1.66 mg/L to 5.21 mg/L). Field parameters were generally consistent with the previous monitoring events.

4.2.1.2 Groundwater gauging

Groundwater depth ranged from 52.58 mAHD (MW403) to 63.04 mAHD (MW141S) which is consistent with historical data. Gauging records are presented in Appendix D.

4.2.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data in order to identify monitoring wells where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 2 in Appendix A presents the groundwater monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	0.56 ²	0.04 (MW141S)	4	0
Sum of PFHxS and PFOS	MW141S	0.07 ²	1.21 (MW141S)	4	1

Notes:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > No new exceedances of guideline values or first time detection of PFOA or Sum of PFOS and PFHxS were reported at any groundwater sampling locations during the July 2021 quarterly monitoring event.
- > The Department of Defence has been advised that the Water Corporation will continue to sample for PFAS at production bores Pinjar bore 140 (Superficial aquifer) and Pinjar bore 145 (Leederville aquifer) on a quarterly basis.

4.3 Tap water

4.3.1 Summary of Field Observations

Stabilised physiochemical parameters and observations recorded during the tap water sampling event are presented in field sampling records, included in Appendix D. No visual or olfactory evidence of contamination was recorded.

Tap water was fresh (TDS ranging from 328.4 mg/L to 639 mg/L), acidic (pH ranging 5.05 to 6.34). Tap water temperature was on average 16.6°C. Field parameters were generally consistent with the previous monitoring events.

4.3.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data in order to identify monitoring wells where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 2 in Appendix A presents the tap water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Tap Water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	0.56 ²	0.05 (POT104)	5	0
Sum of PFHxS and PFOS	POT101, POT102, POT103, POT104, POT105	0.07 ²	1.28 (POT104)	5	5

Notes:

1. Non-inclusive of quality control samples
2. PFAS NEMP guideline value for human health – drinking water

Findings are summarised as follows:

- > No first time detect of PFOA or Sum of PFOS and PFHxS were reported for the tap water locations during the July 2021 quarterly monitoring event.
- > All five tap water samples reported Sum of PFOS and PFHxS concentrations above the drinking water guideline value but below the recreational use value, which is similar to previous monitoring events.
- > All samples reported a detectable concentration of PFOA (i.e. above laboratory LOR) but below the adopted assessment criteria.

4.4 Changes to the Monitoring Network Condition

Abstraction bore 2 (MW402) had a lid screwed at the end of the pipe which prevented sampling (unable to unscrew to obtain sample).

5 Summary and Conclusions

Cardno undertook the July 2021 quarterly groundwater and tap water monitoring event at Gingin Satellite Airfield as part of the PFAS OMP. Groundwater sampling and testing was undertaken at three (3) monitoring wells off-Site, one on-Site abstraction bore and five on-Site taps. One groundwater monitoring well couldn't be sampled as this well was found to be dry and one abstraction bore couldn't be sampled.

The groundwater laboratory results reported the following:

- > Of the four groundwater samples tested, Sum of PFOS and PFHxS (1 sample) reported an exceedance of the HEPA (2020) drinking water guideline value.
- > No exceedances of the guideline values for PFOA were reported for the groundwater samples.

- > No first time detect or new exceedance of guideline values were reported for the quarterly groundwater monitoring locations.
- > Groundwater laboratory results were generally consistent with the previous monitoring events.

The tap water laboratory results reported the following:

- > All five (5) samples tested reported Sum of PFOS and PFHxS concentrations above the drinking water criteria but below the recreational use criteria, which is similar to the previous monitoring events.
- > All five (5) samples reported PFOA concentrations above the laboratory LOR but below the adopted assessment criteria.
- > No first time detect or new exceedance of guideline values were reported for the tap water monitoring locations.

The next OMP sampling event for Gingin Satellite Airfield will be the biannual monitoring event (post winter 2021), scheduled for September 2021.

6 References

General References

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

Site Specific References

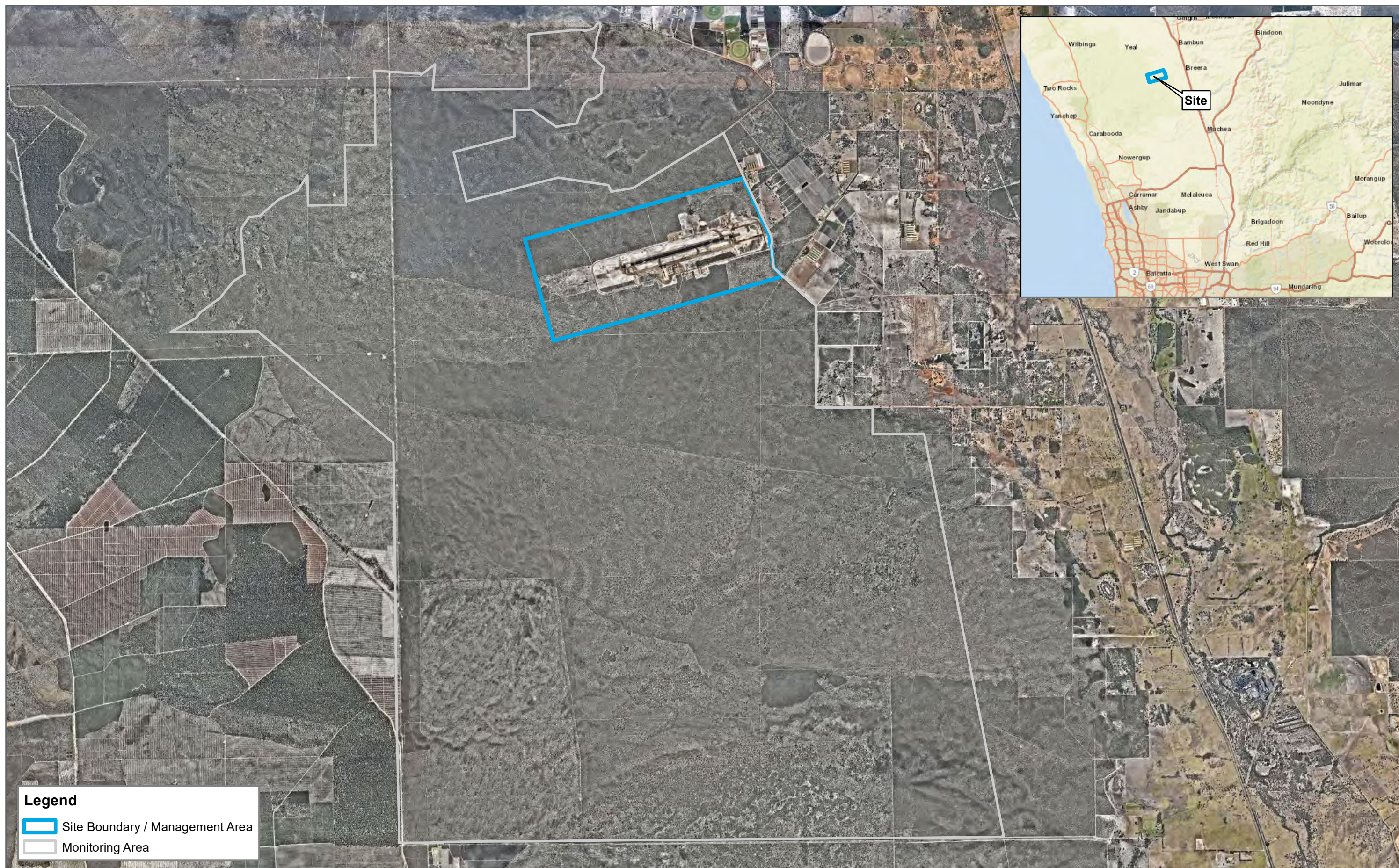
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20. Cardno, December 2020, PFAS OMP, Biannual Monitoring Factual Report – post-winter 2020.
21. Cardno, May 2021, PFAS OMP Quarterly Monitoring Factual Report - January 2021
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25. Jacobs, 2018a, Preliminary Conceptual Site Model - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0001).
26. Jacobs, 2018b, Sampling, Analysis and Quality Plan - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0002).
27. Jacobs, 2018c, Detailed Site Investigation - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-003).
28. Jacobs, 2018d, Tier 2 Human Health Risk Assessment – Offsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0005).

29. Jacobs, 2018e, Tier 3 Human Health Risk Assessment – Onsite Receptors - Gingin Satellite Airfield Comprehensive PFAS Investigations (No. IS219200-0000- NP- RPT-0006).
30. Jacobs, 2019, PFAS Ongoing Groundwater Monitoring Report (No. IS219200-0000-NP-RPT-0008).

APPENDIX

A

FIGURES



Legend

 Site Boundary / Management Area

 Monitoring Area

FIGURE 1
1:60,000 Scale at A3

Meters

0 1,000 2,000

Site Location

QUARTERLY SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-12 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Nearmap

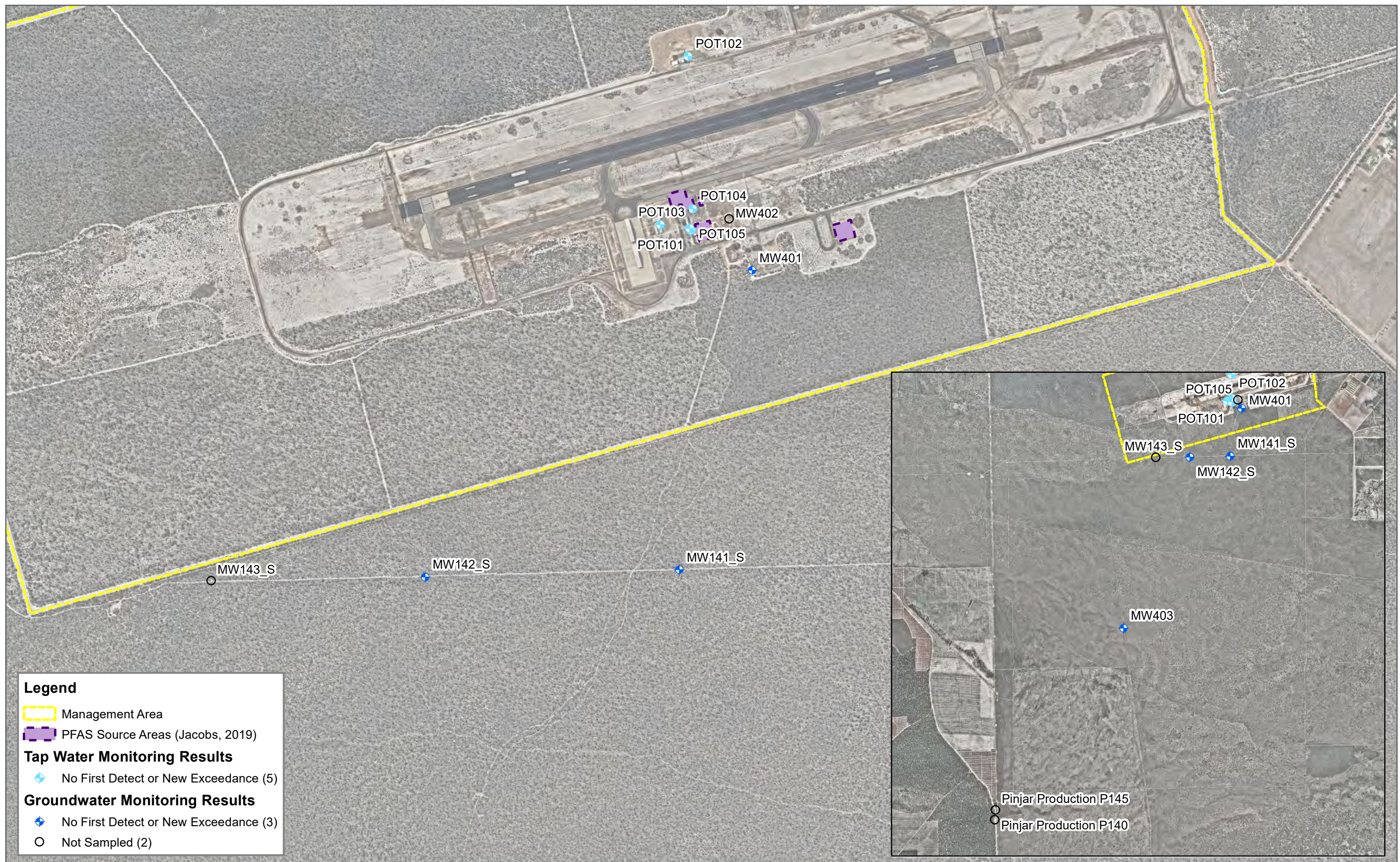


FIGURE 2
1:11,000 Scale at A3

Meters
0 200 400

Monitoring Locations & Results Summary

QUARTERLY SAMPLING EVENT
GINGIN SATELLITE AIRFIELD
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: GDA 1994 MGA Zone 50
Map: DEF19009_WA_0958-GS-002_2021Q1PFASResults 01.mxd
Aerial Imagery Supplied by Nearmap (March 2020)

APPENDIX

B

DATA ASSESSMENT TABLES



Table B1 - Laboratory Results

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
LOR - Limit of Reporting	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	
PFAS NEMP 2020 Drinking Water											0.56							
PFAS NEMP 2020 Recreational Water											10							

Field ID	Date	Location Code	Lab Report No.																	
0958_MW141S_210715	15/07/2021	MW141S	EP2108063	0.10	0.10	0.80	0.05	0.41	<0.02	<0.1	0.19	0.03	0.03	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_MW142S_210715	15/07/2021	MW142S	EP2108063	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_MW401_210715	15/07/2021	MW401	EP2108063	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_MW403_210715	15/07/2021	MW403	EP2108063	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_POT101_210715	15/07/2021	POT101	EP2108063	0.10	0.08	0.56	0.05	0.41	<0.02	<0.1	0.17	0.03	<0.02	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_POT102_210715	15/07/2021	POT102	EP2108063	0.12	0.11	0.70	0.06	0.46	<0.02	<0.1	0.20	0.04	0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_POT103_210715	15/07/2021	POT103	EP2108063	0.10	0.09	0.62	0.05	0.41	<0.02	<0.1	0.17	0.03	0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_POT104_210715	15/07/2021	POT104	EP2108063	0.12	0.11	0.76	0.06	0.52	<0.02	<0.1	0.22	0.04	0.03	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0958_POT105_210715	15/07/2021	POT105	EP2108063	0.10	0.10	0.64	0.05	0.45	<0.02	<0.1	0.18	0.04	0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02

Environmental Standards

HEPA, January 2020, PFAS NEMP 2020 Drinking Water
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Notes:

- First time detect of PFOA or PFOS+PFHxS
- New Exceedance of guideline value



Table B1 - Laboratory Results

	PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides								PFAS						
	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)		Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting	0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05		0.01	0.01	0.01	1	1	1	1
PFAS NEMP 2020 Drinking Water														0.07					
PFAS NEMP 2020 Recreational Water														2					

Field ID	Date	Location Code	Lab Report No.																		
0958_MW141S_210715	15/07/2021	MW141S	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.60	1.21	1.75	<1	<1	<1	<1
0958_MW142S_210715	15/07/2021	MW142S	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	<1	<1	<1
0958_MW401_210715	15/07/2021	MW401	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	11	<1	11
0958_MW403_210715	15/07/2021	MW403	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	3	<1	3
0958_POT101_210715	15/07/2021	POT101	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.30	0.97	1.43	<1	33	<1	33
0958_POT102_210715	15/07/2021	POT102	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.58	1.16	1.75	<1	23	<1	23
0958_POT103_210715	15/07/2021	POT103	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.39	1.03	1.53	<1	10	<1	10
0958_POT104_210715	15/07/2021	POT104	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.74	1.28	1.91	<1	10	<1	10
0958_POT105_210715	15/07/2021	POT105	EP2108063	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.47	1.09	1.62	<1	35	<1	35

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Drinking Water
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Notes:
First time detect of PFOA or PFOS+PFHxS
New Exceedance of guideline value



Table B1 - Laboratory Results

	Inorganics									Metals			Organic
	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting	0.01	0.01	1	0.01	0.01	1	1	10	5	1	1	1	1
PFAS NEMP 2020 Drinking Water													
PFAS NEMP 2020 Recreational Water													

Field ID	Date	Location Code	Lab Report No.													
0958_MW141S_210715	15/07/2021	MW141S	EP2108063	2.28	2.07	58	4.77	4.39	34	31	228	24	1	6	2	33
0958_MW142S_210715	15/07/2021	MW142S	EP2108063	1.79	1.78	53	0.27	4.12	34	14	222	59	<1	3	2	36
0958_MW401_210715	15/07/2021	MW401	EP2108063	1.40	1.23	42	6.46	6.10	24	<1	100	<5	<1	2	1	6
0958_MW403_210715	15/07/2021	MW403	EP2108063	3.11	2.95	94	2.62	5.55	56	19	199	62	1	5	2	2
0958_POT101_210715	15/07/2021	POT101	EP2108063	5.60	4.26	175	13.5	6.90	98	<2	304	<5	<1	<1	<1	4
0958_POT102_210715	15/07/2021	POT102	EP2108063	6.23	4.92	203	11.7	6.89	112	2	346	<5	<1	<1	2	5
0958_POT103_210715	15/07/2021	POT103	EP2108063	6.02	4.88	205	10.5	6.79	111	2	328	<5	<1	<1	2	5
0958_POT104_210715	15/07/2021	POT104	EP2108063	5.94	4.92	202	9.36	6.61	112	2	331	<5	<1	<1	2	5
0958_POT105_210715	15/07/2021	POT105	EP2108063	5.78	4.35	180	14.1	6.94	100	<2	314	<5	<1	<1	<1	5

Environmental Standards

HEPA, January 2020, PFAS NEMP 2020 Drinking Water
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Notes:

- First time detect of PFOA or PFOS+PFHxS
- New Exceedance of guideline value



Table B2 - Rinsate and Blank Results

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomers		
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05
PFAS NEMP 2020 Drinking Water											0.56								
PFAS NEMP 2020 Recreational Water											10								

Field ID	Date	Lab Report Number																				
0958_QC301_210715	15/07/2021	EP2108063	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	
0958_QC401_210715	15/07/2021	EP2108063	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Drinking Water
HEPA, January 2020, PFAS NEMP 2020 Recreational Water



Table B2 - Rinsate and Blank Results

	Per Sulfonic Acids		PFAS - Perfluoroalkyl Sulfonamides								PFAS		
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
LOR - Limit of Reporting	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01	
PFAS NEMP 2020 Drinking Water											0.07		
PFAS NEMP 2020 Recreational Water											2		

Field ID	Date	Lab Report Number												
0958_QC301_210715	15/07/2021	EP2108063	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0958_QC401_210715	15/07/2021	EP2108063	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Environmental Standards

HEPA, January 2020, PFAS NEMP 2020 Drinking Water

HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Field ID		0958_MW1415_210715		0958_QC101_210715				0958_MW1415_210715		0958_QC201_210715				0958_POT101_210715		0958_QC102_210715				0958_POT101_210715		0958_QC202_210715			
Date		15/07/2021		15/07/2021				15/07/2021		15/07/2021				15/07/2021		15/07/2021				15/07/2021		15/07/2021			
Matrix Type		Water		Water				Water		Water				Water		Water				Water		Water			
Lab Report Number		EP2108063		EP2108063		RPD		EP2108063		812060		RPD		EP2108063		EP2108063		RPD		EP2108063		812060		RPD	
	Unit	LOR																							
PFAS - Perfluoroalkyl Sulfonic Acids																									
Perfluoropropanesulfonic acid (PFPPs)	µg/L	0.01							0.03														0.04		
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.10	0.09	11	0.10	0.07	35	0.10	0.10	0	0.10	0.07	35											
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.10	0.09	11	0.10	0.10	0	0.08	0.09	12	0.08	0.09	12											
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.80	0.74	8	0.80	0.78	3	0.56	0.56	0	0.56	0.54	4											
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.05	0.06	18	0.05	0.06	18	0.05	0.04	22	0.05	0.04	22											
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.41	0.44	7	0.41	0.39	5	0.41	0.46	11	0.41	0.35	16											
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01					<0.01						<0.01												
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0											
PFAS - Perfluoroalkyl Carboxylic Acids																									
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0											
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.19	0.19	0	0.19	0.15	24	0.17	0.17	0	0.17	0.14	19											
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.03	0.03	0	0.03	0.03	0	0.03	0.04	29	0.03	0.04	29											
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.03	0.02	40	0.03	0.02	40	<0.02	<0.02	0	<0.02	0.02	0											
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.04	0.04	0	0.04	0.05	22	0.03	0.04	29	0.03	0.03	0											
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0											
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0											
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0											
Perfluorotetradecanoic acid (PFTrDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0											
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0											
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0											
PFAS - Fluorotelomer Sulfonic Acids																									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0											
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0											
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0											
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0											
PFAS - Perfluoroalkyl Sulfonamides																									
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0											
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0											
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0											
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0											
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0											
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0											
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0											
PFAS																									
Sum of PFAS (WA DER List)	µg/L	0.01	1.60	1.55	3	1.60	1.49	7	1.30	1.37	5	1.30	1.19	9											
Sum of PFHxS and PFOS	µg/L	0.01	1.21	1.18	3	1.21	1.17	3	0.97	1.02	5	0.97	0.89	9											
Sum of PFAS	µg/L	0.01	1.75	1.70	3	1.75	1.68	4	1.43	1.50	5	1.43	1.36	5											
Sum of onHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					1.22						0.92												
Inorganics																									
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1			<1	<1	0	<1													
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	<1	<1	0	<1			33	38	14	33													
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1			<1	<1	0	<1													
Alkalinity (total) as CaCO3	mg/L	1			0				33	38	14	33													
Anions Total	meq/L	0.01	2.28	2.24	2	2.28			5.60	5.89	5	5.60													
Cations Total	meq/L	0.01	2.07	2.07	0	2.07			4.26	4.44	4	4.26													
Chloride	mg/L	1	58	56	4	58			175	182	4	175													
Ionic Balance	%	0.01	4.77	3.98	18	4.77			13.5	14.1	4	13.5													
pH (Lab)	pH Units	0.01	4.39	4.27	3	4.39	4.7	7	6.90	6.90	0	6.90	7.0	1											
Sodium (filtered)	mg/L	1	34	34	0	34			98	102	4	98													
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	31	32	3	31			<2	<5	0	<2													
TDS	mg/L	10	228	216	5	228	220	4	304	312	3	304	320	5											
Total Suspended Solids	mg/L	1	24	48	67	24	51	72	<5	<5	0	<5	1.7	0											
Metals																									
Calcium (filtered)	mg/L	1	1	1	0	1			<1	<1	0	<1													
Magnesium (filtered)	mg/L	1	6	6	0	6			<1	<1	0	<1													
Potassium (filtered)	mg/L	1	2	2	0	2			<1	<1	0	<1													
Organic																									
Dissolved Organic Carbon	mg/L	1	33			33			4			4													

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

APPENDIX

C

LABORATORY CERTIFICATES OF ANALYSIS



CHAIN OF CUSTODY

COC#: 25325

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - Q3 2021

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0958_MW141W		15/07/2021 10:18 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0958_QC101		15/07/2021 10:19 AM	Water	ALS: 3 Non ALS: 0	No	Partial 7/8			
003	0958_MW142S		15/07/2021 10:32 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0958_MW403		15/07/2021 11:13 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0958_MW401		15/07/2021 11:54 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0958_POT101		15/07/2021 12:24 PM	Water	ALS: 6 Non ALS: 0	No	X			Extra PFAS bottles for lab QC
007	0958_QC102		15/07/2021 12:26 PM	Water	ALS: 5 Non ALS: 0	No	Partial 7/8			Extra PFAS bottles for lab QC
008	0958_POT105		15/07/2021 12:34 PM	Water	ALS: 4 Non ALS: 0	No	X			
009	0958_POT104		15/07/2021 12:42 PM	Water	ALS: 4 Non ALS: 0	No	X			



CHAIN OF CUSTODY

COC#: 25325

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - Q3 2021

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0958_POT103		15/07/2021 12:51 PM	Water	ALS: 4 Non ALS: 0	No	X			
011	0958_POT102		15/07/2021 01:05 PM	Water	ALS: 4 Non ALS: 0	No	X			
012	0958_QC301		15/07/2021 01:10 PM	Water	ALS: 2 Non ALS: 0	No		X		
013	0958_QC401		15/07/2021 01:10 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

COC#: 25325

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - Q3 2021

ORDER NO: DEF19009/330

PROJECT MANAGER: [REDACTED]

PRIMARY SAMPLER: [REDACTED]

EMAIL REPORTS TO: [REDACTED]

EMAIL INVOICES TO: [REDACTED]

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

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

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
002	0958_QC101	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)
007	0958_QC102	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)



CHAIN OF CUSTODY

COC#: 25325

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - Q3 2021

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0958_MW141W	Clear Plastic Bottle - Natural	250 mL	00070719041836	Green	No	
001	0958_MW141W	HDPE (no PTFE)	20 mL	00350019170766	Grey	No	
001	0958_MW141W	HDPE (no PTFE)	20 mL	00350019170657	Grey	No	
001	0958_MW141W	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220048968	Purple	No	
002	0958_QC101	HDPE (no PTFE)	20 mL	00352005020533	Grey	No	
002	0958_QC101	HDPE (no PTFE)	20 mL	00352005020527	Grey	No	
002	0958_QC101	Clear Plastic Bottle - Natural	250 mL	00070719175626	Green	No	
003	0958_MW142S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019013	Purple	No	
003	0958_MW142S	Clear Plastic Bottle - Natural	250 mL	00071020084175	Green	No	
003	0958_MW142S	HDPE (no PTFE)	20 mL	00352010070650	Grey	No	
003	0958_MW142S	HDPE (no PTFE)	20 mL	00352010070763	Grey	No	
004	0958_MW403	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019071	Purple	No	
004	0958_MW403	Clear Plastic Bottle - Natural	250 mL	00071020084251	Green	No	
004	0958_MW403	HDPE (no PTFE)	20 mL	00352010070630	Grey	No	
004	0958_MW403	HDPE (no PTFE)	20 mL	00352010070548	Grey	No	
005	0958_MW401	Clear Plastic Bottle - Natural	250 mL	00071020084232	Green	No	
005	0958_MW401	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019043	Purple	No	
005	0958_MW401	HDPE (no PTFE)	20 mL	00352010070718	Grey	No	
005	0958_MW401	HDPE (no PTFE)	20 mL	00352010070517	Grey	No	
006	0958_POT101	Clear Plastic Bottle - Natural	250 mL	00071020084179	Green	No	
006	0958_POT101	HDPE (no PTFE)	20 mL	00352010070670	Grey	No	
006	0958_POT101	HDPE (no PTFE)	20 mL	00352010070648	Grey	No	
006	0958_POT101	HDPE (no PTFE)	20 mL	00352010040193	Grey	No	
006	0958_POT101	HDPE (no PTFE)	20 mL	00352010040419	Grey	No	
006	0958_POT101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018540	Purple	No	
007	0958_QC102	Clear Plastic Bottle - Natural	250 mL	00071020084255	Green	No	

Thursday, July 15, 2021

6:52:16 AM



CHAIN OF CUSTODY

COC#: 25325

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0958_PFSOMP

SITE: DEF19009/Gingin - Q3 2021

ORDER NO: DEF19009/330

PROJECT MANAGER:

PRIMARY SAMPLER:

EMAIL REPORTS TO:

EMAIL INVOICES TO:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

C

Other comments:

007	0958_QC102	HDPE (no PTFE)	20 mL	00352010040396	Grey	No	
007	0958_QC102	HDPE (no PTFE)	20 mL	00352010040061	Grey	No	
007	0958_QC102	HDPE (no PTFE)	20 mL	00352010070684	Grey	No	
007	0958_QC102	HDPE (no PTFE)	20 mL	00352010070767	Grey	No	
008	0958_POT105	HDPE (no PTFE)	20 mL	00352010070707	Grey	No	
008	0958_POT105	HDPE (no PTFE)	20 mL	00352010070740	Grey	No	
008	0958_POT105	Clear Plastic Bottle - Natural	250 mL	00071020083822	Green	No	
008	0958_POT105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018585	Purple	No	
009	0958_POT104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018957	Purple	No	
009	0958_POT104	Clear Plastic Bottle - Natural	250 mL	00071020084129	Green	No	
009	0958_POT104	HDPE (no PTFE)	20 mL	00352010070593	Grey	No	
009	0958_POT104	HDPE (no PTFE)	20 mL	00352010070756	Grey	No	
010	0958_POT103	Clear Plastic Bottle - Natural	250 mL	00071020084263	Green	No	
010	0958_POT103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020019054	Purple	No	
010	0958_POT103	HDPE (no PTFE)	20 mL	00352010070516	Grey	No	
010	0958_POT103	HDPE (no PTFE)	20 mL	00352010070644	Grey	No	
011	0958_POT102	HDPE (no PTFE)	20 mL	00352010070663	Grey	No	
011	0958_POT102	HDPE (no PTFE)	20 mL	00352010070655	Grey	No	
011	0958_POT102	Clear Plastic Bottle - Natural	250 mL	00071020084244	Green	No	
011	0958_POT102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020018283	Purple	No	
012	0958_QC301	HDPE (no PTFE)	20 mL	00352010040250	Grey	No	
012	0958_QC301	HDPE (no PTFE)	20 mL	00352010040211	Grey	No	
013	0958_QC401	HDPE (no PTFE)	20 mL	00352010040371	Grey	No	
013	0958_QC401	HDPE (no PTFE)	20 mL	00352010040275	Grey	No	

Total Bottle Count: ALS: 50, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2108063**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: [REDACTED]@cardno.com.au	E-mail	: [REDACTED]@alsglobal.com
Telephone	: ----	Telephone	: [REDACTED]
Facsimile	: ----	Facsimile	: [REDACTED]
Project	: WA_0958_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/330	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 25325	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Gingin		
Sampler	: [REDACTED]		

Dates

Date Samples Received	: 15-Jul-2021 14:50	Issue Date	: 15-Jul-2021
Client Requested Due Date	: 23-Jul-2021	Scheduled Reporting Date	: 23-Jul-2021

Delivery Details

Mode of Delivery	: Client Drop Off	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 7.4 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 13 / 13

General Comments

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



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2108063-001	15-Jul-2021 10:18	0958_MW141W_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-002	15-Jul-2021 10:19	0958_QC101_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-003	15-Jul-2021 10:32	0958_MW142S_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-004	15-Jul-2021 11:13	0958_MW403_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-005	15-Jul-2021 11:54	0958_MW401_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-006	15-Jul-2021 12:24	0958_POT101_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-007	15-Jul-2021 12:26	0958_QC102_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-008	15-Jul-2021 12:34	0958_POT105_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-009	15-Jul-2021 12:42	0958_POT104_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-010	15-Jul-2021 12:51	0958_POT103_210715	✓	✓	✓	✓	✓	✓	✓
EP2108063-011	15-Jul-2021 13:05	0958_POT102_210715	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2108063-001	15-Jul-2021 10:18	0958_MW141W_210715	✓
EP2108063-002	15-Jul-2021 10:19	0958_QC101_210715	✓
EP2108063-003	15-Jul-2021 10:32	0958_MW142S_210715	✓
EP2108063-004	15-Jul-2021 11:13	0958_MW403_210715	✓
EP2108063-005	15-Jul-2021 11:54	0958_MW401_210715	✓
EP2108063-006	15-Jul-2021 12:24	0958_POT101_210715	✓
EP2108063-007	15-Jul-2021 12:26	0958_QC102_210715	✓
EP2108063-008	15-Jul-2021 12:34	0958_POT105_210715	✓
EP2108063-009	15-Jul-2021 12:42	0958_POT104_210715	✓
EP2108063-010	15-Jul-2021 12:51	0958_POT103_210715	✓
EP2108063-011	15-Jul-2021 13:05	0958_POT102_210715	✓
EP2108063-012	15-Jul-2021 13:10	0958_QC301_210715	✓
EP2108063-013	15-Jul-2021 13:10	0958_QC401_210715	✓



Proactive Holding Time Report

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

Requested Deliverables

[REDACTED]	Email	[REDACTED]
- A4 - AU Tax Invoice (INV)		
DERP LAB REPORTS		
- EDI Format - ESDAT (ESDAT)	Email	[REDACTED]
[REDACTED]		
- A4 - AU Tax Invoice (INV)	Email	[REDACTED]
[REDACTED]		
- *AU Certificate of Analysis - NATA (COA)	Email	[REDACTED] cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	[REDACTED] cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	[REDACTED] cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	[REDACTED] cardno.com.au
- Chain of Custody (CoC) (COC)	Email	[REDACTED] cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	[REDACTED] cardno.com.au
- EDI Format - XTab (XTAB)	Email	[REDACTED] cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2108063**
Client : **CARDNO (WA) PTY LTD**
Contact : [REDACTED]
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0958_PFASOMP
Order number : DEF19009/330
C-O-C number : 25325
Sampler : [REDACTED]
Site : DEF19009/Gingin
Quote number : SY/139/19
No. of samples received : 13
No. of samples analysed : 13

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : [REDACTED]
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : [REDACTED]
Date Samples Received : 15-Jul-2021 14:50
Date Analysis Commenced : 16-Jul-2021
Issue Date : 22-Jul-2021 17:02



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

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

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- ED041G (Sulfate Turbidimetric): LOR for samples EP2108063-006, -007 and -008 raised due to possible sample matrix interference.
- Ionic Balance out of acceptable limits for sample #6, 7, 8, 10 and 11 due to analytes not quantified in this report. Major cations (ED093F) and major anions (ED041G/ED045G/ED037-P) have been confirmed by re-analysis.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW141W_210715	0958_QC101_210715	0958_MW142S_210715	0958_MW403_210715	0958_MW401_210715
Sampling date / time				15-Jul-2021 10:18	15-Jul-2021 10:19	15-Jul-2021 10:32	15-Jul-2021 11:13	15-Jul-2021 11:54
Compound	CAS Number	LOR	Unit	EP2108063-001	EP2108063-002	EP2108063-003	EP2108063-004	EP2108063-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	4.39	4.27	4.12	5.55	6.10
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	228	216	222	199	100
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	24	48	59	62	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	<1	3	11
Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	<1	3	11
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	31	32	14	19	<1
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	58	56	53	94	42
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1	1	<1	1	<1
Magnesium	7439-95-4	1	mg/L	6	6	3	5	2
Sodium	7440-23-5	1	mg/L	34	34	34	56	24
Potassium	7440-09-7	1	mg/L	2	2	2	2	1
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	2.28	2.24	1.79	3.11	1.40
∅ Total Cations	----	0.01	meq/L	2.07	2.07	1.78	2.95	1.23
∅ Ionic Balance	----	0.01	%	4.77	3.98	0.27	2.62	6.46
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	33	----	36	2	6
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.10	0.09	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.10	0.09	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.80	0.74	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.05	0.06	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW141W_2107 15	0958_QC101_210715	0958_MW142S_21071 5	0958_MW403_210715	0958_MW401_210715
Sampling date / time				15-Jul-2021 10:18	15-Jul-2021 10:19	15-Jul-2021 10:32	15-Jul-2021 11:13	15-Jul-2021 11:54
Compound	CAS Number	LOR	Unit	EP2108063-001	EP2108063-002	EP2108063-003	EP2108063-004	EP2108063-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.41	0.44	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.03	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.19	0.19	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0958_MW141W_2107 15	0958_QC101_210715	0958_MW142S_21071 5	0958_MW403_210715	0958_MW401_210715
Sampling date / time				15-Jul-2021 10:18	15-Jul-2021 10:19	15-Jul-2021 10:32	15-Jul-2021 11:13	15-Jul-2021 11:54
Compound	CAS Number	LOR	Unit	EP2108063-001	EP2108063-002	EP2108063-003	EP2108063-004	EP2108063-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.75	1.70	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.21	1.18	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.60	1.55	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	93.1	108	99.6	106	105
13C8-PFOA	----	0.02	%	101	106	104	104	106



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_POT101_21071 5	0958_QC102_210715	0958_POT105_21071 5	0958_POT104_21071 5	0958_POT103_21071 5
Sampling date / time				15-Jul-2021 12:24	15-Jul-2021 12:26	15-Jul-2021 12:34	15-Jul-2021 12:42	15-Jul-2021 12:51
Compound	CAS Number	LOR	Unit	EP2108063-006	EP2108063-007	EP2108063-008	EP2108063-009	EP2108063-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.90	6.90	6.94	6.61	6.79
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	304	312	314	331	328
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	33	38	35	10	10
Total Alkalinity as CaCO3	----	1	mg/L	33	38	35	10	10
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<2	<5	<2	2	2
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	175	182	180	202	205
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	<1	<1	<1	<1
Magnesium	7439-95-4	1	mg/L	<1	<1	<1	<1	<1
Sodium	7440-23-5	1	mg/L	98	102	100	112	111
Potassium	7440-09-7	1	mg/L	<1	<1	<1	2	2
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	5.60	5.89	5.78	5.94	6.02
∅ Total Cations	----	0.01	meq/L	4.26	4.44	4.35	4.92	4.88
∅ Ionic Balance	----	0.01	%	13.5	14.1	14.1	9.36	10.5
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	4	----	5	5	5
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.10	0.10	0.10	0.12	0.10
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	0.09	0.10	0.11	0.09
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.56	0.56	0.64	0.76	0.62
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.05	0.04	0.05	0.06	0.05



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_POT101_21071 5	0958_QC102_210715	0958_POT105_21071 5	0958_POT104_21071 5	0958_POT103_21071 5
Sampling date / time				15-Jul-2021 12:24	15-Jul-2021 12:26	15-Jul-2021 12:34	15-Jul-2021 12:42	15-Jul-2021 12:51
Compound	CAS Number	LOR	Unit	EP2108063-006	EP2108063-007	EP2108063-008	EP2108063-009	EP2108063-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.41	0.46	0.45	0.52	0.41
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.04	0.04	0.04	0.03
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.17	0.17	0.18	0.22	0.17
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.02	0.03	0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.03	0.04	0.04	0.05	0.04
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_POT101_21071 5	0958_QC102_210715	0958_POT105_21071 5	0958_POT104_21071 5	0958_POT103_21071 5
Sampling date / time				15-Jul-2021 12:24	15-Jul-2021 12:26	15-Jul-2021 12:34	15-Jul-2021 12:42	15-Jul-2021 12:51
Compound	CAS Number	LOR	Unit	EP2108063-006	EP2108063-007	EP2108063-008	EP2108063-009	EP2108063-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.43	1.50	1.62	1.91	1.53
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.97	1.02	1.09	1.28	1.03
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.30	1.37	1.47	1.74	1.39
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	112	106	106	101	98.6
13C8-PFOA	----	0.02	%	112	103	108	108	103



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_POT102_21071 5	0958_QC301_210715	0958_QC401_210715	----	----
Sampling date / time				15-Jul-2021 13:05	15-Jul-2021 13:10	15-Jul-2021 13:10	----	----
Compound	CAS Number	LOR	Unit	EP2108063-011	EP2108063-012	EP2108063-013	-----	-----
Result				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	6.89	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	346	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	23	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	23	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	203	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	<1	----	----	----	----
Magnesium	7439-95-4	1	mg/L	<1	----	----	----	----
Sodium	7440-23-5	1	mg/L	112	----	----	----	----
Potassium	7440-09-7	1	mg/L	2	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	6.23	----	----	----	----
∅ Total Cations	----	0.01	meq/L	4.92	----	----	----	----
∅ Ionic Balance	----	0.01	%	11.7	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.12	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.11	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.70	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.06	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0958_POT102_21071 5	0958_QC301_210715	0958_QC401_210715	----	----
Sampling date / time					15-Jul-2021 13:05	15-Jul-2021 13:10	15-Jul-2021 13:10	----	----
Compound	CAS Number	LOR	Unit		EP2108063-011	EP2108063-012	EP2108063-013	-----	-----
				Result	Result	Result		----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		0.46	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		0.04	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		0.20	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		0.04	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0958_POT102_21071 5	0958_QC301_210715	0958_QC401_210715	----	----
Sampling date / time				15-Jul-2021 13:05	15-Jul-2021 13:10	15-Jul-2021 13:10	----	----
Compound	CAS Number	LOR	Unit	EP2108063-011	EP2108063-012	EP2108063-013	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.75	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.16	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.58	<0.01	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	108	103	111	----	----
13C8-PFOA	----	0.02	%	107	108	107	----	----



Surrogate Control Limits

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

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

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

- (WATER) EP231A: Perfluoroalkyl Sulfonic Acids
- (WATER) EP231B: Perfluoroalkyl Carboxylic Acids
- (WATER) EP231C: Perfluoroalkyl Sulfonamides
- (WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids
- (WATER) EP231P: PFAS Sums
- (WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2108063	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Contact	: [REDACTED]
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 15-Jul-2021
Order number	: DEF19009/330	Date Analysis Commenced	: 16-Jul-2021
C-O-C number	: 25325	Issue Date	: 22-Jul-2021
Sampler	: [REDACTED]		
Site	: DEF19009/Gingin		
Quote number	: SY/139/19		
No. of samples received	: 13		
No. of samples analysed	: 13		



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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
[REDACTED]	Inorganics Supervisor	Perth Inorganics, Wangara, WA
[REDACTED]	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
[REDACTED]	Metals Chemist	Perth Inorganics, Wangara, WA
[REDACTED]	LCMS Coordinator	Sydney Organics, Smithfield, NSW

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

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

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

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

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3796419)									
EP2108042-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.51	7.52	0.1	0% - 20%
EP2108061-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.74	6.72	0.3	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3796422)									
EP2108063-004	0958_MW403_210715	EA005-P: pH Value	----	0.01	pH Unit	5.55	5.58	0.5	0% - 20%
EP2108069-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	6.35	6.40	0.8	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3798508)									
EP2108000-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	998	965	3.4	0% - 20%
EP2108063-008	0958_POT105_210715	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	314	316	0.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3798509)									
EP2108000-007	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EP2108063-010	0958_POT103_210715	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3796421)									
EP2108063-004	0958_MW403_210715	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	3	3	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	3	3	0.0	No Limit
EP2108061-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	16	15	0.0	0% - 50%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	16	15	0.0	0% - 50%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3799653)									
EP2108063-008	0958_POT105_210715	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<2	<2	0.0	No Limit
EP2108053-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1530	1510	1.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3799652)									

Page : 3 of 6
 Work Order : EP2108063
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED045G: Chloride by Discrete Analyser (QC Lot: 3799652) - continued									
EP2108063-008	0958_POT105_210715	ED045G: Chloride	16887-00-6	1	mg/L	180	179	0.6	0% - 20%
EP2108053-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	2440	2460	0.9	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3796120)									
EP2108061-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	8	8	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	27	27	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	239	237	0.6	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	9	9	0.0	No Limit
EP2108063-010	0958_POT103_210715	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	111	110	1.3	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3801415)									
EP2108045-015	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	1	0.0	No Limit
EP2108076-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	26	27	0.0	0% - 20%



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

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

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3796419)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3796422)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3798508)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	104	88.1	114
				<10	1000 mg/L	104	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3798509)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	109	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3796421)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	101	81.2	126
				<1	200 mg/L	100.0	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3799653)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	99.5	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3799652)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	102	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3796120)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	98.6	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.4	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.4	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3801415)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	105	73.2	116
				<1	100 mg/L	102	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3798764)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
					Concentration	LCS	Low	High
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3798764) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	101	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	93.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	116	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	109	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	97.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3798764)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	100	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	100	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	105	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	99.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	112	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	115	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	109	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	105	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	106	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3798764)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	94.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	84.5	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	86.1	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	95.0	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	91.9	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	119	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	122	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3798764)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	111	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	108	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	90.4	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	95.2	71.4	144

Matrix Spike (MS) Report

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



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3799653)							
EP2108053-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3799652)							
EP2108053-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	78.9	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3801415)							
EP2108063-001	0958_MW141W_210715	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2108063	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: [REDACTED]	Telephone	: [REDACTED]
Project	: WA_0958_PFASOMP	Date Samples Received	: 15-Jul-2021
Site	: DEF19009/Gingin	Issue Date	: 22-Jul-2021
Sampler	: [REDACTED]	No. of samples received	: 13
Order number	: DEF19009/330	No. of samples analysed	: 13

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Page : 2 of 8
 Work Order : EP2108063
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2108053--003	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715,	----	----	----	16-Jul-2021	15-Jul-2021	1

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	13	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	13	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715,	15-Jul-2021	----	----	----	16-Jul-2021	15-Jul-2021	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715,	15-Jul-2021	----	----	----	19-Jul-2021	22-Jul-2021	✔
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715,	15-Jul-2021	----	----	----	19-Jul-2021	22-Jul-2021	✔
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715,	15-Jul-2021	----	----	----	16-Jul-2021	29-Jul-2021	✔
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715,	15-Jul-2021	----	----	----	21-Jul-2021	12-Aug-2021	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715	15-Jul-2021	----	----	----	21-Jul-2021	12-Aug-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715	15-Jul-2021	----	----	----	16-Jul-2021	22-Jul-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0958_MW141W_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT104_210715, 0958_POT102_210715	0958_MW142S_210715, 0958_MW401_210715, 0958_POT105_210715, 0958_POT103_210715	15-Jul-2021	----	----	----	20-Jul-2021	12-Aug-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715, 0958_QC401_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715, 0958_QC301_210715	15-Jul-2021	20-Jul-2021	11-Jan-2022	✓	20-Jul-2021	11-Jan-2022	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0958_MW141W_210715, 0958_MW142S_210715, 0958_MW401_210715, 0958_QC102_210715, 0958_POT104_210715, 0958_POT102_210715, 0958_QC401_210715	0958_QC101_210715, 0958_MW403_210715, 0958_POT101_210715, 0958_POT105_210715, 0958_POT103_210715, 0958_QC301_210715	15-Jul-2021	20-Jul-2021	11-Jan-2022	✓	20-Jul-2021	11-Jan-2022	✓

Page : 5 of 8
 Work Order : EP2108063
 Client : CARDNO (WA) PTY LTD
 Project : WA_0958_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		15-Jul-2021	20-Jul-2021	11-Jan-2022	✔	20-Jul-2021	11-Jan-2022	✔
0958_MW141W_210715,	0958_QC101_210715,							
0958_MW142S_210715,	0958_MW403_210715,							
0958_MW401_210715,	0958_POT101_210715,							
0958_QC102_210715,	0958_POT105_210715,							
0958_POT104_210715,	0958_POT103_210715,							
0958_POT102_210715,	0958_QC301_210715,							
0958_QC401_210715								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		15-Jul-2021	20-Jul-2021	11-Jan-2022	✔	20-Jul-2021	11-Jan-2022	✔
0958_MW141W_210715,	0958_QC101_210715,							
0958_MW142S_210715,	0958_MW403_210715,							
0958_MW401_210715,	0958_POT101_210715,							
0958_QC102_210715,	0958_POT105_210715,							
0958_POT104_210715,	0958_POT103_210715,							
0958_POT102_210715,	0958_QC301_210715,							
0958_QC401_210715								
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		15-Jul-2021	20-Jul-2021	11-Jan-2022	✔	20-Jul-2021	11-Jan-2022	✔
0958_MW141W_210715,	0958_QC101_210715,							
0958_MW142S_210715,	0958_MW403_210715,							
0958_MW401_210715,	0958_POT101_210715,							
0958_QC102_210715,	0958_POT105_210715,							
0958_POT104_210715,	0958_POT103_210715,							
0958_POT102_210715,	0958_QC301_210715,							
0958_QC401_210715								



Quality Control Parameter Frequency Compliance

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

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	13	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	13	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: Cardno (WA)
Contact name: [REDACTED]
Project name: WA_0958_PFASOMP
Project ID: WA_0958_PFASOMP
Turnaround time: 5 Day
Date/Time received: Jul 21, 2021 11:02 AM
Eurofins reference: 812060

Sample Information

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

Notes

Contact

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

[REDACTED] on phone : [REDACTED] or by email: [REDACTED]

Results will be delivered electronically via email to [REDACTED] - [REDACTED]@cardno.com.au.

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

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
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NATA # 1261 Site # 18217

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Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
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Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rourke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

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

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

Project Name: WA_0958_PFASOMP
Project ID: WA_0958_PFASOMP

Order No.: DEF19009/330
Report #: 812060
Phone: [REDACTED]
Fax: [REDACTED]

Received: Jul 21, 2021 11:02 AM
Due: Jul 28, 2021
Priority: 5 Day
Contact Name: [REDACTED]

Eurofins Analytical Services Manager : [REDACTED]

Sample Detail						pH (at 25 °C)	Total Suspended Solids Dried at 103-105°C	Per- and Polyfluoralkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X		X
Sydney Laboratory - NATA Site # 18217									
Brisbane Laboratory - NATA Site # 20794								X	
Perth Laboratory - NATA Site # 23736									
Mayfield Laboratory - NATA Site # 25079									
External Laboratory									
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID				
1	0958_QC201_210715	Jul 15, 2021		Water	P21-JI39300	X	X	X	X
2	0958_QC202_210715	Jul 15, 2021		Water	P21-JI39301	X	X	X	X
Test Counts						2	2	2	2

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES



Date	Specific Site	Monitoring Location	Sample_ID	TOC (mAHD)	Well Depth (m)	Screen Interval (bgl)	SWL (mbTOC)	RWL (mAHD)	Comments	Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	QC Dup Sample #	Odour	colour
15/07/2021	Off-Site Monitoring Well	MW141S	0958_MW141S_210715	74.36	16.5	13.5-16.5	11.32	63.04	QC101/201	HydroSleeve	18.3	2.76	263.4	170.95	4.45	20.5	101/201	no	Yellow,Clear
15/07/2021	Off-Site Monitoring Well	MW142S	0958_MW142S_210715	76.34	15.5	12.4-15.4	13.86	62.48		HydroSleeve	18.2	3.5	232.4	150.8	4.12	262.6		no	Clear,Brown
15/07/2021	Off-Site Monitoring Well	MW143S		75.81	18.5	14-18.5			Dry	HydroSleeve									
15/07/2021	Base Fire Water Supply Infrastructure	MW401	0958_MW401_210715	NA	NA	NA				Tap	19.2	5.21	155	100.75	5.65	43.3		no	Clear
15/07/2021	Base Water Supply Infrastructure	MW402		NA	NA	NA			Unable to unscrew the lid at end of tap/pipe to sample										
15/07/2021	Off-Site Monitoring Well	MW403	0958_MW403_210715	73.84	26	14-26	21.26	52.58		HydroSleeve	18.1	1.66	346.1	224.9	5.05	218.3		no	Clear,Brown
15/07/2021	Base Water Supply Infrastructure	POT101	0958_POT101_210715							Tap	15.7	7.49	579.8	377	5.94	214.7	102/202	no	Clear
15/07/2021	Base Water Supply Infrastructure	POT102	0958_POT102_210715							Tap	16.4	6.25	346.1	224.9	6.32	366.2		no	Clear
15/07/2021	Base Water Supply Infrastructure	POT103	0958_POT103_210715							Tap	14.8	9.26	623	403	6.34	630.3		no	Clear
15/07/2021	Base Water Supply Infrastructure	POT104	0958_POT104_210715							Tap	19.8	6.71	639	416	6.16	446		no	Clear
15/07/2021	Base Water Supply Infrastructure	POT105	0958_POT105_210715							Tap	16.6	7.85	328.4	213.2	6.04	227.4		no	Clear

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno

Contact:

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 20B120527

Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
	Condition	✓	Good, clean
	pH millivolts for pH7 calibration range 0 mV ± 50 mV	✓	
	pH 4 mV range + 165 to + 180 from 7 buffer mV value	✓	172.40 mV
	pH slope	✓	55 to 60 mV/pH, ideal 59mV 58.33
	Response time < 90 seconds	✓	
	Calibrated and conforms to manufacturer's specifications	✓	
ORP			
	Condition	✓	Good, clean
	Response time < 90 seconds	✓	
	within ± 80mv of reference Zobell Reading	✓	
	Calibrated and conforms to manufacturer's specifications	✓	variance range ± 20mV 3 mV
Conductivity			
	Condition	✓	Good, clean
	Temperature	✓	°C
	Conductivity cell constant 5.0 ± 1.0 in GLP file	✓	
	Clean sensor reads less than 3 uS/cm in dry air	✓	
	Calibrated and conforms to manufacturer's specifications	✓	µs/cm
Dissolved Oxygen			
	Condition	✓	Good, clean
	DO sensor in use	✓	Galvanic
	1.25 mil PE membrane (yellow membrane):	✓	
	DO Sensor Value	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
	Calibrated and conforms to manufacturer's specifications	✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Instrument Readings

Parameter	Standards	Reference	Calibration Point	Span	Units	Before	After	Units
Temperature	Check Temp NATA	Room Temp	18.1	0	°C	NA	18.1	°C
pH	pH 7.00	356684	7.01	-33.30	mV	7.05	7.01	pH
pH	pH 4.00	355385	4.00	139.10	mV	4.03	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	4.95	2770	2764	µs/cm
ORP (Reference check only)	Zobell A & B	21/0502	244	244	mV	234.2	241	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	0	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	4.13	uA	86.5	100.0	%

Calibrated by:

Calibration Date: 13-Jul-21

Next Due: 09-Jan-22

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review PFAS Ongoing Monitoring Plan Q3 2021 Quarterly Monitoring

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
QA Documentation	
Project Quality Plan/Work Plan and Data Quality Objectives	<p>The field investigation was carried out on 15 July 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (ref DEF19009_Report04.1_Gingin Satellite Airfield_ OMP PFAS_SAQP) issued to the client and in general compliance with Standards Australia 1998. AS/NZ 5667:1998 <i>Water quality – sampling</i> and NEPM “National Environment Protection (Assessment of Site Contamination) Measure”.</p> <p>A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (PFAS OMP Q3 2021 Factual Report). In addition, a safety, health and environment work method statement (SHEWMS) was also prepared.</p> <p>The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.</p>
Data Representativeness	
Use of Composites	No Composites were used during the investigation
Holding Times	<p>Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes. with the exception of the following:</p> <ul style="list-style-type: none"> ▪ EP2108063 <ul style="list-style-type: none"> - pH – one days overdue (All samples) <p>The holding time exceedances for pH are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.</p>
Background samples	No background samples were collected during the course of the investigation.
Verification of field procedures	<p>The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP.</p> <p>Non-disposable equipment was decontaminated between sample locations.</p>

QA/QC Aspects		Evidence & Evaluation	
Data Precision & Accuracy			
QC sample Frequency	QC sample type	SAQP required frequency	Sample Collected
	Blind duplicate	1 in 10 primary samples (10%)	1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)
	Split duplicate	1 in 10 primary samples (10%)	1 for 6 tap water samples (17%) 1 for 3 groundwater samples (33%)
	Rinsate	1 per YSI per day	1 for 1 day (100%)
	Field Blank	1 per day	1 for 1 day (100%)
QC Testing – Blind Replicates (Primary Lab)	RPD Acceptance Criteria:		
	Magnitude of Results		Acceptable RPD range
	< 10 x LOR		No limits
	10 – 20 LOR		0% - 50%
	> 20 x LOR		0% - 20%
Groundwater			
Primary Groundwater Samples Analysed: 3			
Blind Replicate Samples Analysed: 1			
All RPDs were within acceptance criteria.			
Tap water			
Primary tap water Samples Analysed: 6			
Blind Replicate Samples Analysed: 1			
All RPDs were within acceptance criteria.			
QC Testing – Field Splits (Secondary Lab)	RPD Acceptance Criteria:		
	Magnitude of Results		Acceptable RPD range
	< 10 x LOR		No limits
	10 – 20 LOR		0% - 50%
	> 20 x LOR		0% - 20%
Groundwater			
Primary Groundwater Samples Analysed: 3			
Field Split Samples Analysed: 1			
All RPDs were within acceptance criteria with the exception of TSS (RPD + 72%).			
Tap water			
Primary tap water Samples Analysed: 6			
Field Split Samples Analysed: 1			
All RPDs were within acceptance criteria.			
Field Blanks	Field Blanks were collected at a rate of one per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.		
Laboratory Internal QC	Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and satisfactory results for method blank, laboratory control samples and laboratory duplicates.		
	The following Matrix Spike outlier was recorded:		
	EP2108063 <ul style="list-style-type: none">Sulfate as SO4- MS recovery not determined, background level greater than or equal to 4x spike level.		
	The following Quality Control sample frequency non-conformance was reported:		
	EP2108063		

QA/QC Aspects	Evidence & Evaluation
	<ul style="list-style-type: none"> - Laboratory duplicate (PFAS): expected rate: 10%, actual: 0%. - Matrix Spike (PFAS): expected rate: 5%, actual: 0%. <p>No Method Blank value outliers were reported.</p>
Laboratory Method Detection Limit	Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.
NATA endorsement of laboratory reports	<p>Laboratory reports were stamped with the NATA endorsement stamp and signature.</p> <p>ALS Accreditation No. 825</p> <p>Eurofins Accreditation No. 1261</p>
Calibration of Field Equipment	<p>All equipment used during the investigation was calibrated by the supplier prior to use.</p> <p>The equipment calibration certificates are provided in Appendix D.</p>
Decontamination and Equipment Blanks	Rinsate blanks were collected at a rate of one per day when reusable equipment (water quality meter) was used. All rinsate samples tested reported analytes concentrations below the laboratory LORs.
Data Comparability	
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
Data Completeness	
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- ☐ A factual report of the condition of a portion of the site or one aspect of an entire site.
- ☐ Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- ☐ Validation of the success of remediation of a site or a portion of a site.
- ☐ Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide “environmental sign-off” of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants’ duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the “hot spot” method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

APPENDIX

D

DATA ASSESSMENT



now



Alt Report No.	Field ID	Location Code	Date	0.05	0.08	0.40	0.03	0.11	<0.02	<0.01	0.03	<0.02	<0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.1	<0.02	<0.05	<0.1	<0.02	<0.5					
203878	0958_MW101_I_180320	MW1001	20/03/2018	0.05	0.08	0.40	0.03	0.11	<0.02	<0.01	0.03	<0.02	<0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.1	<0.02	<0.05	<0.1	<0.02	<0.5					
222957	0958_MW101_I_190225		25/02/2019	0.05	0.05	0.41	0.02	0.19	<0.02	<0.02	0.04	<0.02	<0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		0.6	0.78		
EP1910901	0958_MW101_191023		23/10/2019	0.05	0.06	0.40	0.03	0.18	<0.02	<0.01	0.04	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.69	0.58	0.78	
EP2004453	0958_MW101_D_200504		4/05/2020	<0.02	<0.02	0.12	<0.02	0.23	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.35	0.35	0.35
EP2104666	0958_MW101_210428		28/04/2021	<0.04	<0.04	0.16	<0.04	0.09	<0.04	<0.2	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.10	<0.04	<0.04	<0.05	<0.05	<0.05	<0.05	<0.04	<0.10	<0.04	<0.10	<0.10	<0.04	<0.10	0.25	0.25	0.25	
208244	0958_MW102_D_180319	MW1020	19/03/2018	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5					
223277	0958_MW102_D_190306		6/03/2019	<0.01	<0.01	0.02	<0.01	0.02	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		0.04	0.04		
EP2004453	0958_MW102_D_200504		4/05/2020	0.03	0.04	0.31	<0.02	0.16	<0.02	0.2	0.03	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.74	0.47	0.78	
EP2011490	0958_MW102_201021		21/10/2020	0.04	0.05	0.34	0.02	0.15	<0.02	<0.1	0.03	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.57	0.49	0.64	
EP2104666	0958_MW102D_210428		28/04/2021	0.13	<0.02	0.20	0.03	0.28	<0.02	<0.1	0.02	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.64	0.48	0.67	
208793	0958_MW103_S_180329 H	MW1035	29/03/2018	0.12	0.33	6.0	0.96	7.6	<0.02	0.04	0.60	0.08	0.08	0.69	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5					
232193	0958_MW103_S_180329 M		29/03/2018	0.05	0.40	7.3	1.1	7.3	<0.02	0.06	0.70	0.1	0.10	0.77	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5					
223132	0958_MW103_S_190301		1/03/2019	0.17	0.41	7.9	1.2	7.9	<0.02	0.05	0.78	0.1	0.08	0.25	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5					
EP1911008	0958_MW103_191025		25/10/2019	0.07	0.16	2.32	0.06	3.67	<0.02	<0.1	0.38	0.06	0.04	0.25	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	6.79	5.99	7.21	
208696	0958_MW104_I_180327		MW1041	27/03/2018	<0.01	0.01	0.10	<0.01	0.07	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5				
223277	0958_MW104_I_190305	5/03/2019		<0.01	0.01	0.09	<0.01	0.07	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		0.16	0.17		
EP1911008	0958_MW104_I_191025	25/10/2019		0.08	0.12	1.46	0.06	1.19	<0.02	<0.1	0.23	<0.02	0.03	0.06	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	3.1	2.65	3.28		
EP2004672	0958_MW104_I_20200507	7/05/2020		<0.02	<0.02	0.04	<0.02	0.04	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.08	0.08	0.08	
EP2011490	0958_MW104_201021	21/10/2020		<0.02	<0.02	0.20	<0.02	0.18	<0.02	<0.1	0.03	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.41	0.38	0.41	
EP2104665	0958_MW104I_210428	28/04/2021	0.04	0.03	0.26	<0.02	0.13	<0.02	<0.1	0.05	<0.02	0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.49	0.39	0.52		
208696	0958_MW105_D_180327	MW1050	27/03/2018	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5					
223277	0958_MW105_D_190306		6/03/2019	0.02	0.04	0.40	0.01	0.31	<0.02	<0.02	0.06	<0.02	<0.01	0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		0.71	0.85		
EP1911008	0958_MW105_191025		25/10/2019	<0.02	<0.02	0.10	<0.02	0.11	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.21	0.21	0.21	
EP2004672	0958_MW105_D_20200507		7/05/2020	<0.02	0.03	0.37	<0.02	0.50	<0.02	<0.1	0.05	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.94	0.87	0.97	
EP2011490	0958_MW105_201021		21/10/2020	<0.02	<0.02	0.05	<0.02	0.04	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.09	0.09	0.09	
EP2104665	0958_MW105D_210428	28/04/2021	0.07	0.13	1.33	0.07	1.13	<0.02	<0.1	0.19	0.03	0.03	0.08	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	2.86	2.46	3.06		
208378	0958_MW106_S_180320	MW1065	20/03/2018	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.1	<0.02	<0.05	<0.1	<0.02	<0.5		<0.01	<0.01		
223132	0958_MW106_S_190304		4/03/2019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5					
EP1911007	0958_MW106_191025		25/10/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
EP2004672	0958_MW106_S_20200507		7/05/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
EP2011633	0958_MW106_201023		23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
208619	0958_MW106S_210427	MW1075	27/04/2021	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5		<0.01	<0.01		
208619	0958_MW107_S_180323		23/03/2018	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.02	<0.01	<0.02	<0.05	<0.01	<0																

		PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides								PFAS					
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTDA)	Perfluorohexadecanoic acid (PFHxDA)	Perfluorooctadecanoic acid (PFODA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (PFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorodecane sulfonamide (MeFDSA)	N-methyl perfluorooctane sulfonamide (MeFOSE)	N-ethyl perfluorooctane sulfonamide (EFOA)	N-ethyl perfluorodecane sulfonamide (EFDA)	N-ethyl perfluorooctane sulfonamide (EFOSA)	N-ethyl perfluorodecane sulfonamide (EFHOSA)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS			
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		
LOR - Limit of Reporting		0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01	0.02	0.02	0.01	0.05	0.02	0.01	0.01	0.01	0.01	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01	0.01	0.01		
PFAS NEMP 2020 Drinking Water												0.56																		0.07					
PFAS NEMP 2020 Recreational Water												10																		2					
Lab Report No.	Field ID	Location Code		Date																															
223597	0958_MW141_S_190312	MW141S		12/03/2019	0.05	0.06	0.54	0.03	0.25	<0.02	<0.01	0.11	<0.02	0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5	0.94	0.79	1.1
EP1911007	0958_MW141_191025			25/10/2019	0.06	0.06	0.52	0.04	0.21	<0.02	<0.1	0.12	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.19	0.85	1.35
EP2002549	0958_MW141_S_200310			10/03/2020	0.07	0.10	0.64	0.06	0.21	<0.02	<0.1	0.16	0.05	0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.32	1.02	1.45
EP2004672	0958_MW141_S_20200507			7/05/2020	0.07	0.08	0.69	0.05	0.33	<0.02	<0.1	0.16	0.03	<0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.74	1.32	1.92
EP2008767	0958_MW141_200819			19/08/2020	0.10	0.11	0.87	0.07	0.45	<0.02	<0.1	0.20	0.04	0.03	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.42	0.83	1.23
EP2011633	0958_MW141_210123			23/10/2020	0.04	0.03	0.34	<0.02	0.08	<0.02	<0.1	0.08	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.56	0.42	0.59
EP2100912	0958_MW141_210128			28/01/2021	0.06	0.07	0.62	0.04	0.21	<0.02	<0.1	0.15	0.02	0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.12	0.93	1.37
EP2104679	0958_MW141S_210428			28/04/2021	0.07	0.09	0.66	0.04	0.27	<0.02	<0.1	0.16	0.02	0.02	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.24	0.93	1.37
EP2108063	0958_MW141S_210715			15/07/2021	0.10	0.10	0.80	0.05	0.41	<0.02	<0.1	0.19	0.03	0.03	0.04	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.6	1.21	1.75
223597	0958_MW142_S_190312	MW142S		12/03/2019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5	<0.01	<0.01	<0.01	
EP1911007	0958_MW142_191025			25/10/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2002549	0958_MW142_S_200310			10/03/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2004672	0958_MW142_S_20200507			7/05/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2008767	0958_MW142_200819			19/08/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2011863	0958_MW142_201023			23/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2100912	0958_MW142_210128			28/01/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2104679	0958_MW142S_210428			28/04/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
EP2108063	0958_MW142S_210715			15/07/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
223597	0958_MW143_S_190312	MW143S		12/03/2019	<0.01	<0.01	0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5			0.01	0.01
EP2002549	0958_MW143_S_200310			10/03/2020	<0.02	<0.02	0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.03	0.02	0.03
EP1514030	WA0072-MW001	MW301		18/09/2015					8.8																										

		PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides								PFAS				
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFHxA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluoromethanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTs)	6:2 Fluorotelomer sulfonic acid (6:2 FTs)	8:2 Fluorotelomer sulfonic acid (8:2 FTs)	10:2 Fluorotelomer sulfonic acid (10:2 FTs)	Perfluorooctane sulfonamide (PFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSSE)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EFOSSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS		
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
[OR - Limit of Reporting		0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.02	0.02	0.01	0.05	0.02	0.02	0.01	0.01	0.01	0.01	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01		
PFAS NEMP 2020 Drinking Water												0.56																						
PFAS NEMP 2020 Recreational Water												10																						
Lab Report No.	Field ID	Location Code		Date																														
EP1514030	WA0171-MW017	MW312		18/09/2015								1.06																						
523711	WA0171-MW017			11/11/2016									0.08																					
208619	0958_MW312_180326			26/03/2018	0.02	0.03	0.39	0.02	1.0	<0.02	<0.02	0.05	<0.02	<0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5			
223071	0958_MW312_190228			28/02/2019	0.07	0.10	0.57	0.02	0.96	<0.02	<0.02	0.13	<0.02	0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5	1.5	1.9	
EP1910968	0958_MW312_191024			24/10/2019	0.07	0.07	0.89	<0.02	0.58	<0.02	<0.1	0.12	0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.7	1.77
EP2004509	0958_MW312_200505			5/05/2020	0.02	0.02	0.36	<0.02	0.62	<0.02	<0.1	0.05	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.07	1.08
EP2011490	0958_MW312_201021			21/10/2020	0.04	0.05	0.87	0.03	0.36	<0.02	<0.1	0.11	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.41	1.23
EP2104665	0958_MW312_210428			28/04/2021	0.08	0.10	0.87	0.06	2.38	<0.02	<0.1	0.19	0.04	0.03	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	3.64	3.25
EP1514030	WA0171-MW018	MW313		18/09/2015								1.64																						
523711	WA0171-MW018			11/11/2016					4.8				0.07																					
208793	0958_MW313_180329_H			29/03/2018	<0.01	<0.01	0.07	<0.01	0.12	<0.02	<0.02	0.02	<0.02	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5			
208793	0958_MW313_180329_M			29/03/2018	0.02	0.02	0.36	0.02	0.73	<0.02	<0.02	0.05	<0.02	<0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5			
223071	0958_MW313_190228			28/02/2019	0.04	0.06	0.51	0.02	0.88	<0.02	<0.02	0.17	<0.02	<0.01	0.02	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5	1.4	1.7	
EP1910968	0958_MW313_191024			24/10/2019	<0.05	<0.05	0.14	<0.05	0.12	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.02	<0.05	<0.12	<0.05	0.26	0.26	
EP2004509	0958_MW313_200505			5/05/2020	0.02	0.03	0.54	0.02	0.84	<0.02	<0.1	0.07	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.5	1.38
EP2011227	0958_MW313_201015			15/10/2020	<0.02	<0.02	0.09	<0.02	0.04	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.13	0.13
EP2104665	0958_MW313_210428	28/04/2021	<0.02	0.03	0.40	0.03	0.47	<0.02	<0.1	0.09	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.98	0.87		
206770-A	0958_Bore_1_180214	MW401		14/02/2018	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5			
208696	0958_Bore_1_180327			27/03/2018	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5			
222957	0958_Bore_1_190225			25/02/2019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.02	<0.05	<0.01	<0.5	<0.1	<0.02	<0.01	<0.01	<0.1	<0.05	<0.02	<0.05	<0.1	<0.02	<0.5	<0.01	<0.01	
EP1910968	0958_MW401_191024			24/10/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
EP2002870	0958_MW401_200318			18/03/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
EP2004453	0958_MW401_200504			4/05/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
EP2008767	0958_MW401_200819			19/08/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
EP2011227	0958_MW401_201015			15/10/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
EP2100912	0958_MW401_210128			28/01/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
EP2104578	0958_MW401_210427			27/04/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01
EP2108063	0958_MW401_210715			15/07/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02</						

				Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Fluoride	Iron Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon	
				mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
[OR - Limit of Reporting]				1	1	1	1	0.01	0.01	1		0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1	
PFAS NEMP 2020 Drinking Water																						
PFAS NEMP 2020 Recreational Water																						
Lab Report No.	Field ID	Location Code	Date																			
208378	0958_MW101_I_180320	MW101I	20/03/2018		93					28	-12			33		180		7.7	3.1	2.5		
222957	0958_MW101_I_190225		25/02/2019		21						15	-6.9			14				0.6	1.2	0.5	
EP1910901	0958_MW101_191023		23/10/2019	<1	13	<1	13	0.71	0.78	16	4.51	6.11	16	<1	90	<1	1	<1			22	
EP2004453	0958_MW101_D_200504		4/05/2020	4	22	<1	27	2.09	2.55	33		8.93	11	30	176	104	41	<1	1	<1	1	19
EP2104666	0958_MW101I_210428	MW102D	28/04/2021	<1	10	<1	10	0.71	0.73	18	1.89	6.45	15	<1	78	16	<1	1	<1	<1	21	
208244	0958_MW102_D_180319		19/03/2018		140					50	-2.1		51		280		29	3.2	6.7			
223277	0958_MW102_D_190306		6/03/2019		100					35	2.1		22				41	1.8	1.3			
EP2004453	0958_MW102_D_200504		4/05/2020	<1	21	<1	21	0.91	0.78	16		6.32	16	2	92	16	<1	1	<1	<1	23	
EP2011490	0958_MW102_201021	MW103S	21/10/2020	<1	10	<1	10	0.65	0.73	16		6.10	15	<1	90	<1	<1	1	<1	<1	21	
EP2104666	0958_MW102D_210428		28/04/2021	<1	51	<1	51	2.73	2.61	31	2.13	7.65	9	40	234	79	44	<1	1	14		
208793	0958_MW103_S_180329_H		29/03/2018															12	2.0	1.1		
208793	0958_MW103_S_180329_M		29/03/2018		30					9	5.6		6.8					8.6	2.0	0.9		
223132	0958_MW103_S_190301	MW104I	1/03/2019		13					14	10		8.4					5	2	<1	14	
EP1911008	0958_MW103_191025		25/10/2019	<1	10	<1	10	0.54	0.72	10		6.21	7	3	76	420	5	2	<1			
208696	0958_MW104_I_180327		27/03/2018		290					77	7.3		150				39	10	6.6			
223277	0958_MW104_I_190305		5/03/2019		34					23	0.90		24				2.8	2.0	1.2			
EP1911008	0958_MW104_191025	MW104I	25/10/2019	60	<1	545	605	13.5	10.9	46	10.6	12.2	19	4	556	757	200	<1	3	10		
EP2004672	0958_MW104_I_20200507		7/05/2020	<1	15	<1	15	0.94	1.03	22	4.71	6.69	19	1	113	16	2	1	1	1	25	
EP2011490	0958_MW104_201021		21/10/2020	<1	88	<1	88	3.03	2.88	43	2.56	7.47	24	3	194	78	32	2	3	7		
EP2104665	0958_MW104I_210428		28/04/2021	<1	20	<1	20	1.00	1.16	19	7.76	6.67	18	3	98	66	5	1	2	26		
208696	0958_MW105_D_180327	MW105D	27/03/2018		280					79	4.3		140				36	12	16			
223277	0958_MW105_D_190306		6/03/2019		<1					44	-8.6		25				35	<0.5	3.4			
EP1911008	0958_MW105_191025		25/10/2019	<1	26	<1	26	1.38	1.44	24	1.98	6.49	22	9	130	7	7	1	2	2	22	
EP2004672	0958_MW105_D_20200507		7/05/2020	<1	52	<1	52	2.39	2.39	45	0.04	7.93	23	4	146	202	23	2	3	7		
EP2011490	0958_MW105_201021	MW106S	21/10/2020	<1	16	<1	16	0.86	1.03	19		6.28	19	<1	116	6	2	1	1	1		
EP2104665	0958_MW105D_210428		28/04/2021	17	9	<1	26	1.97	2.16	44	4.68	9.79	21	10	128	88	24	<1	2	7		
208378	0958_MW106_S_180320		20/03/2018		<1					21	-14		11		150		1.8	3.3	0.7			
223132	0958_MW106_S_190304		4/03/2019		<1					23	-9.3		12				0.9	3.7	0.6			
EP1911007	0958_MW106_191025	MW106S	25/10/2019	<1	<1	<1	<1	1.48	0.86	29		3.37	14	32	196	<1	<1	3	<1	75		
EP2004672	0958_MW106_S_20200507		7/05/2020	<1	<1	<1	<1	2.10	1.40	45		3.31	24	40	299	70	<1	4	1	90		
EP2011633	0958_MW106_201023		23/10/2020	<1	<1	<1	<1	1.24	0.99	30		3.39	17	19	220	410	<1	3	<1	66		
EP2104577	0958_MW106S_210427		27/04/2021	<1	<1	<1	<1	1.40	1.48	40	2.67	3.57	21	13	232	94	2	5	2	73		
208619	0958_MW107_S_180323	MW107S	23/03/2018		<1					48	2.3		33				4.4	21	0.9			
208378	0958_MW108_S_180320	MW108S	20/03/2018		<1					26	-5.1		17		160		3.5	3.4	1.0			
208244	0958_MW109_S_180319	MW109S	19/03/2018		9					11	12		7.2		70		8.3	1.9	0.7			
223132	0958_MW109_S_190304		4/03/2019		<1					12	25		7.6				6.5	1.5	<0.5			
EP1911008	0958_MW109_191025		25/10/2019	<1	<1	<1	<1	1.05	1.01	18	1.72	4.16	10	26	153	82	5	4	<1	42		
EP2004509	0958_MW109_S_200505		5/05/2020	<1	<1	<1	<1	0.92	1.01	12		4.74	11	28	139	587	4	4	<1	23		
EP2011490	0958_MW109_201021	MW110S	21/10/2020	<1	<1	<1	<1	1.08	1.01	16		4.36	11	30	154	156	4	4	<1	31		
EP2104666	0958_MW109S_210428		28/04/2021	<1	<1	<1	<1	0.99	1.00	19	0.34	4.60	12	22	154	232	3	4	<1	31		
208244	0958_MW110_S_180319		19/03/2018		<1					12	12		6.8		60		4.4	2.7	0.6			
223132	0958_MW110_S_190304		4/03/2019		<1					15	16		7.5				5.3	3.0	0.5			
EP1911007	0958_MW110_191025	MW110S	25/10/2019	<1	<1	<1	<1	0.77	0.97	22		4.54	12	7	210	64	4	3	<1	35		
EP2004509	0958_MW110_S_200505		5/05/2020	<1	<1	<1	<1	0.72	0.97	22		4.74	12	5	182	69	4	3	<1	32		
EP2011490	0958_MW110_201021		21/10/2020	<1	<1	<1	<1	0.76	0.88	21		4.56	11	8	194	98	3	3	<1	33		
EP2104666	0958_MW110S_210428		28/04/2021	<1	<1	<1	<1	0.74	0.94	22	11.8	4.95	12	6	286	1,580	3	3	1			
208378	0958_MW111_S_180320	MW111S	20/03/2018		16					21	1.5		14		81		7.5	1.4	1.2			
208244	0958_MW112_S_180319	MW112S	19/03/2018		<1					14	37		8.0		63		7.7	1.1	0.6			
223132	0958_MW112_S_190304		4/03/2019		<1					11	25		6.9				5.6	0.8	<0.5			
EP1910968	0958_MW112_191024		24/10/2019	<1	<1	<1	<1	0.39	0.65	14		4.37	8	<1	118	162	6	<1	<1	46		
EP2004453	0958_MW112_S_200504		4/05/2020	<1	<1	<1	<1	0.48	0.73	17		4.24	10	<1	80	244	6	<1	<1	24		
EP2011490	0958_MW112_201021	MW113S	21/10/2020	<1	<1	<1	<1	0.48	0.69	17		3.95	9	<1	125	167	6	<1	<1	26		
EP2104666	0958_MW112S_210428		28/04/2021	<1	<1	<1	<1	0.56	0.85	20	20.4	4.10	12	<1	146	89	5	1	<1	36		
208378	0958_MW113_S_180320		20/03/2018		<1					16	28		9.5		95		5.3	1.4	<0.5			
223132	0958_MW113_S_190304		4/03/2019		<1					17	19		11				5.8	1.4	<0.5			
EP1910968	0958_MW113_191024	MW113S	24/10/2019	<1	<1	<1	<1	0.56	0.86	20		3.90	11	<10	157	788	6	1	<1	39		
EP2004453	0958_MW113_S_200504		4/05/2020	<1	<1	<1	<1	0.68	1.03	24		3.89	13	<1	112	58	6	2	<1	31		
EP2011490	0958_MW113_201021		21/10/2020	<1	<1	<1	<1	0.82	0.89	29		3.91	14	<1	142	61	4	1	&lt			

				Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Fluoride	Ion Balance	pH (Lab)	Sodium (Filtered)	Sulfate as SO4 - Turbidimetric (Filtered)	TDS	Total Suspended Solids	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Dissolved Organic Carbon
				mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
[OR - Limit of Reporting]				1	1	1	1	0.01	0.01	1		0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1
PFAS NEMP 2020 Drinking Water																					
PFAS NEMP 2020 Recreational Water																					
Lab Report No.	Field ID	Location Code	Date																		
208378	0958_MW122_S_180320	MW122S	20/03/2018	<5	<5					41	5.8			24		140		4.6	3.1	1.3	
223132	0958_MW122_S_190304		4/03/2019	<5	<5					29	11			19				4.0	2.7	0.9	
EP1911007	0958_MW122_191025		25/10/2019	<1	<1	<1	<1	0.73	1.04	26		4.10	16	<5	126	472	3	2	1	36	
EP2004509	0958_MW122_S_200505		5/05/2020	<1	<1	<1	<1	0.93	1.19	30		4.10	19	4	167	89	4	2	<1	41	
EP2011490	0958_MW122_201021		21/10/2020	<1	<1	<1	<1	0.73	1.02	26		4.30	15	<2	151	665	4	2	<1	34	
EP2104679	0958_MW122S_210428		28/04/2021	<1	<1	<1	<1	0.90	1.34	26		4.92	20	8			4	2	4		
208378	0958_MW123_I_180320	MW123I	20/03/2018	<5	<5					21	7.9			14		64		0.8	1.5	0.9	
223277	0958_MW123_I_190305		5/03/2019	<5	<5					27	12			18				1.6	3.6	1.0	
EP1911007	0958_MW123_191025		25/10/2019	<1	2	<1	2	1.17	1.39	32		5.18	21	11	149	<5	2	4	2	38	
EP2004509	0958_MW123_I_200505		5/05/2020	<1	7	<1	7	1.24	1.46	33		6.00	22	8	127	<5	3	4	1	28	
EP2011160	0958_MW123_I_201014		14/10/2020	<1	10	<1	10	1.51	1.68	36		6.14	24	14	156	<5	4	5	1	25	
EP2104679	0958_MW123I_210428		28/04/2021	<1	4	<1	4	1.43	1.61	34	5.85	5.58	23	19	162	30	3	5	2	21	
208793	0958_MW124_D_180328	MW124D	28/03/2018		60					51	-3.6			35				8.0	5.1	4.6	
223277	0958_MW124_D_190306		6/03/2019		34				45	-9.4		26					3.2	3.1	3.0		
EP1911007	0958_MW124_191025		25/10/2019	<1	28	<1	28	1.88	1.67	47		6.32	27	<1	124	7	3	3	4	9	
EP2011490	0958_MW124_201021		21/10/2020	<1	10	<1	10	1.69	1.53	52		5.82	28	1	994	1,990	1	2	4		
EP2104679	0958_MW124D_210428		28/04/2021	<1	24	<1	24	1.75	1.72	45	0.74	6.53	27	<1	157	30	4	3	4	7	
208806	0958_MW125_S_180329	MW125S	29/03/2018																		
222957	0958_MW125_S_190226		26/02/2019		13						13	4.9			13			1.6	4.0	0.5	
EP1910968	0958_MW125_191024		24/10/2019	<1	10	<1	10	0.80	0.78	14	1.75	5.88	11	10	90	16	1	3	<1	17	
EP2004672	0958_MW125_S_20200507		7/05/2020	<1	6	<1	6	0.80	0.77	19	2.08	6.26	12	7	86	37	<1	3	<1	14	
EP2011633	0958_MW125_201023		23/10/2020	<1	7	<1	7	0.79	0.86	18	3.79	6.37	14	7	121	108	<1	3	<1	16	
EP2104577	0958_MW125S_210427		27/04/2021	<1	7	<1	7	0.86	0.90	18	2.48	5.96	15	10	97	35	<1	3	<1	13	
208806	0958_MW126_I_180329	MW126I	29/03/2018																		
222957	0958_MW126_I_190226		26/02/2019		36						43	-8.8		25				3.2	3.5	2.4	
EP1910968	0958_MW126_191024		24/10/2019	<1	24	<1	24	1.66	1.48	42	5.90	6.31	26	<1	120	11	1	3	2	7	
EP2004672	0958_MW126_I_20200507		7/05/2020	<1	17	<1	17	1.61	1.38	45		6.32	25	<1	105	50	<1	3	2	5	
EP2011633	0958_MW126_201023		23/10/2020	<1	18	<1	18	1.60	1.54	44	1.88	6.56	28	<1	105	11	<1	3	3	6	
EP2104577	0958_MW126I_210427		27/04/2021	<1	16	<1	16	1.53	1.45	43	2.61	6.32	26	<1	113	15	<1	3	3	4	
208806	0958_MW128_S_180329	MW128D	29/03/2018																		
222957	0958_MW128_S_190226		26/02/2019		7						40	1.4		26				0.9	2.5	0.7	
EP1910968	0958_MW128_191024		24/10/2019	<1	5	<1	5	1.43	1.38	42	1.70	5.67	28	7	134	183	<1	2	<1	12	
EP2004672	0958_MW128_S_20200507		7/05/2020	<1	4	<1	4	1.51	1.38	44	4.36	6.05	28	9	128	157	<1	2	<1	11	
EP2011633	0958_MW128_201023		23/10/2020	<1	7	<1	7	1.51	1.62	42	3.48	6.00	31	9	127	179	<1	3	1	14	
EP2104577	0958_MW128S_210427		27/04/2021	<1	3	<1	3	1.64	1.66	39	0.77	5.82	32	23	118	134	<1	3	1	10	
208793	0958_MW129_I_180329	MW129S	29/03/2018		37					46	-3.1		31					4.5	3.5	2.3	
222957	0958_MW129_I_190226		26/02/2019		12						45	-3.8		26				0.9	2.5	1.4	
EP1910968	0958_MW129_191024		24/10/2019	<1	8	<1	8	1.46	1.53	46	2.33	5.88	29	<1	112	19	1	2	2	13	
EP2004672	0958_MW129_I_20200507		7/05/2020	<1	8	<1	8	1.51	1.39	48	4.26	6.32	27	<1	126	104	<1	2	2	6	
EP2011633	0958_MW129_201023		23/10/2020	<1	8	<1	8	1.65	1.56	53	2.97	6.10	29	<1	144	163	<1	3	2	9	
EP2104577	0958_MW129I_210427		27/04/2021	<1	6	<1	6	1.47	1.39	47	2.67	5.84	27	1	112	86	<1	2	2	6	
222957	0958_MW130_D_190226	MW130D	26/02/2019		57					43	0.99		35					10	3.9	4.4	
EP1910968	0958_MW130_191024		24/10/2019	<1	38	<1	38	1.99	1.99	43	0.03	6.70	28	1	156	28	8	3	5	7	
EP2004672	0958_MW130_D_20200507		7/05/2020	<1	28	<1	28	1.87	1.84	45	0.93	6.99	25	2	148	77	8	3	4	6	
EP2011633	0958_MW130_201023		23/10/2020	<1	26	<1	26	1.78	1.90	44	3.35	6.70	26	1	134	83	8	3	5	7	
EP2104577	0958_MW130D_210427		27/04/2021	<1	25	<1	25	1.76	1.77	44	0.32	6.70	26	1	144	75	7	2	5	4	
208793	0958_MW131_S_180329	MW131D	29/03/2018		92					26	-6.0		30					11	5.2	2.6	
222957	0958_MW131_S_190227		27/02/2019		42						19	11		23				0.99	1.7	0.5	
EP1910968	0958_MW131_191024		24/10/2019	<1	31	<1	31	1.44	1.38	24	2.11	6.20	28	7	116	47	<1	2	<1	14	
EP2004592	0958_MW131_S_200506		6/05/2020	<1	27	<1	27	1.33	1.34	25	0.42	6.32	27	4	84	192	<1	2	<1	9	
EP2011633	0958_MW131_201023		23/10/2020	<1	29	<1	29	1.29	1.30	23	0.19	6.40	26	3	90	153	<1	2	<1	15	
EP2104577	0958_MW131D_210427		27/04/2021	<1	25	<1	25	1.72	1.67	42	1.58	6.66	27	2	112	21	4	3	2	8	
208806	0958_MW132_I_180329	MW132I	29/03/2018																		
223277	0958_MW132_I_190305		5/03/2019		17						21	-4.4		17				0.6	1.3	0.6	
EP1910968	0958_MW132_191024		24/10/2019	<1	11	<1	11	0.87	0.78	23	5.18	6.07	18	<1	80	7	<1	<1	<1	14	
EP2004592	0958_MW132_I_200506		6/05/2020	<1	26	<1	26	1.70	1.67	42	0.95	6.63	27	<1	100	10	4	3	2	9	
EP2011633	0958_MW132_201023		23/10/2020	<1	27	<1	27	1.78	1.82	44	1.19	6.66	28	<1	106	28	4	4	3	9	
EP2104577	0958_MW132I_210427		27/04/2021	<1	24	<1	24	1.18	1.13	19	2.42	6.43	24	8	97	111	<1	1	<1	8	
222957	0958_MW133_D_190227	MW133D	27/02/2019		<5					43	-0.33		25					25	<0.5	1.8	
EP1910																					

				Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (Filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Organic Carbon
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting				1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1
PFAS NEMP 2020 Drinking Water																				
PFAS NEMP 2020 Recreational Water																				
Lab Report No.	Field ID	Location Code	Date																	
223597	0958_MW141_S_190312	MW141S	12/03/2019	<1	<1	<1	<1	1.76	1.79	53	3.5		27				1.3	4.7	1.2	
EP1911007	0958_MW141_191025		25/10/2019	<1	<1	<1	<1	1.70	1.79	53	4.83	30	13	165	<5		1	5	1	26
EP2002549	0958_MW141_S_200310		10/03/2020	<1	<1	<1	<1	1.70	1.89	53	5.25	5.02	31	10	172	22	1	6	<1	29
EP2004672	0958_MW141_S_20200507		7/05/2020	<1	<1	<1	<1	1.77	1.79	54	0.53	4.94	30	12	186	13	1	5	1	29
EP2008767	0958_MW141_200819		19/08/2020	<1	<1	<1	<1	1.84	1.90	54	1.84	4.53	32	15	182	32	1	5	2	26
EP2011633	0958_MW141_201023		23/10/2020	<1	<1	<1	<1	1.62	1.58	53	1.33	5.20	30	6	126	36	<1	3	1	13
EP2100912	0958_MW141_210128		28/01/2021	<1	<1	<1	<1	1.93	2.29	53		4.66	36	21	206	9	2	7	2	44
EP2104679	0958_MW141S_210428		28/04/2021	<1	<1	<1	<1	2.04	2.20	54	3.67	4.46	35	25	254	46	1	7	2	43
EP2108063	0958_MW141S_210715		15/07/2021	<1	<1	<1	<1	2.28	2.07	58	4.77	4.39	34	31	228	24	1	6	2	33
223597	0958_MW142_S_190312	MW142S	12/03/2019	<1	<1	<1	<1	1.78	2.08	61		4.32	36	3	238	74	2.2	6.1	1.8	
EP1911007	0958_MW142_191025		25/10/2019	<1	<1	<1	<1	1.66	1.96	59	8.31	4.41	34	<1	208	37	1	5	2	49
EP2002549	0958_MW142_S_200310		10/03/2020	<1	<1	<1	<1	1.77	2.16	62		4.27	38	1	250	60	1	5	2	45
EP2004672	0958_MW142_S_20200507		7/05/2020	<1	<1	<1	<1	1.75	2.12	62		4.29	38	<1	235	23	<1	5	2	42
EP2011863	0958_MW142_201029		29/10/2020	<1	<1	<1	<1	2.05	2.21	63	3.78	4.36	39	13	230	80	1	5	2	43
EP2100912	0958_MW142_210128		28/01/2021	<1	<1	<1	<1	1.47	1.90	52		4.17	35	<1	198	52	<1	4	2	48
EP2104679	0958_MW142S_210428		28/04/2021	<1	<1	<1	<1	1.51	1.86	49		4.25	34	6	224	67	<1	4	2	45
EP2108063	0958_MW142S_210715		15/07/2021	<1	<1	<1	<1	1.79	1.78	53	0.27	4.12	34	14	222	59	<1	3	2	36
223597	0958_MW143_S_190312		MW143S	12/03/2019		8			63	3.8			36					3.5	6.1	1.4
EP2002549	0958_MW143_S_200310	10/03/2020		<1	1	<1	1	2.08	2.06	62	0.63	5.28	34	15	382	16,400	<1	7	<1	10
EP1514030	WA0072-MW001	MW301	18/09/2015																	
523711	WA0072_MW001		11/11/2016																	
208619	0958_MW301_180326		26/03/2018		<1			11	28		6.4						7.5	1.0	<0.5	
223071	0958_MW301_190228		28/02/2019		<1			10	26		6.0						6.3	0.8	<0.5	
EP1910968	0958_MW301_191024		24/10/2019	<1	<1	<1	<1	0.42	0.60	15		3.96	7	<20	142	32	6	<1	<1	35
EP2004453	0958_MW301_200504		4/05/2020	<1	<1	<1	<1	0.51	0.96	18		3.66	11	<1	107	98	8	1	<1	27
EP2011490	0958_MW301_201021		21/10/2020	<1	<1	<1	<1	0.54	1.01	19		3.64	11	<2	158	112	9	1	<1	30
EP2104666	0958_MW301_210428		28/04/2021	<1	<1	<1	<1	0.65	1.18	23	29.3	3.65	12	<2	154	182	10	2	<1	30
EP1514030	WA0072-MW002		MW302	18/09/2015																
523711	WA0072_MW002	11/11/2016																		
208793	0958_MW302_180329_H	29/03/2018			<1			9	34		7.2						4.9	0.7	1.3	
208793	0958_MW302_180329_M	29/03/2018			<1			11	33		6.8						7.1	0.9	1.1	
223071	0958_MW302_190228	28/02/2019			<1			9			9	<1	118	57	7	7	7	<1	<1	24
EP1910968	0958_MW302_191024	24/10/2019		<1	<1	<1	<1	0.45	0.74	16		3.81	9	<1	94	232	6	1	<1	18
EP2004453	0958_MW302_200504	4/05/2020		<1	<1	<1	<1	0.42	0.82	15		3.84	10	<1	94	232	6	1	<1	18
EP2011490	0958_MW302_201021	21/10/2020		<1	<1	<1	<1	0.45	0.79	16		4.08	9	<2	134	186	8	<1	<1	19
EP2104666	0958_MW302_210428	28/04/2021		<1	<1	<1	<1	0.48	0.78	17	24.1	4.02	10	<2	124	409	7	<1	<1	19
EP1514030	WA0072-MW003	MW303	18/09/2015																	
523711	WA0072_MW003		11/11/2016																	
208619	0958_MW303_180326		26/03/2018		<1			10	29		6.6						6.2	0.9	1	
223071	0958_MW303_190228		28/02/2019		<1			11	32		6.7						6.5	1.0	1.0	
EP1910968	0958_MW303_191024		24/10/2019	<1	<1	<1	<1	0.45	0.73	16		4.04	10	<1	100	<1	6	<1	<1	20
EP2004453	0958_MW303_200504		4/05/2020	<1	<1	<1	<1	0.45	0.73	16		3.94	11	<1	81	70	5	<1	<1	20
EP2011490	0958_MW303_201021		21/10/2020	<1	<1	<1	<1	0.54	0.86	19		3.95	11	<2	114	72	6	1	<1	18
EP2104666	0958_MW303_210428		28/04/2021	<1	<1	<1	<1	0.59	0.73	21	10.3	4.12	11	<2	97	115	5	<1	<1	20
EP1208227	WA0073-MW004	MW304	3/10/2012	<1	22	<1	22	1	1	21		15	29				15	4	2	
EP1307135	WA0073-MW004		18/09/2013	<1	4	<1	4	1.68	1.88	19	5.78		17	51			12	6	2	
EP1514001	WA0073-MW004		17/09/2015																	
524161	WA0073-MW004		15/11/2016																	
208619	0958_MW304_180326		26/03/2018		23			29	24		21						34	9.4	4.0	
223132	0958_MW304_190301		1/03/2019		30			22	22		17						38	7.0	5.4	
EP1911008	0958_MW304_191025		25/10/2019	<1	4	<1	4	1.64	2.06	23		5.35	15	44	208	78	13	8	4	28
EP2004509	0958_MW304_200505		5/05/2020	<1	10	<1	10	2.44	2.74	25	5.65	6.11	18	74	238	406	19	11	4	27
EP2011227	0958_MW304_201015		15/10/2020																	23
EP1307095	WA0073-MW005	MW305	17/09/2013	<1	<1	<1	<1	1.89	2.05	16			16	69			8	11	2	
EP1514001	WA0073-MW005		17/09/2015																	
524161	WA0073-MW005		15/11/2016																	
208619	0958_MW305_180326		26/03/2018		<1			15	7.1		8.8						6.0	8.3	1.5	
223071	0958_MW305_190228		28/02/2019		<1			16	9.5		9.0						5.8	7.7	1.5	
EP1911008	0958_MW305_191025		25/10/2019	<1	<1	<1	<1	1.17	1.33	17	6.53	4.91	11	33	140	246	5	7	1	20
EP2011227	0958_MW305_201015		15/10/2020																</	

				Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	% Ionic Balance	pH (Lab)	Sodium (Filtered)	Sulphate as SO4 - Turbidimetric (Filtered)	TDS	Total Suspended Solids	Calcium (Filtered)	Magnesium (Filtered)	Potassium (Filtered)	Dissolved Organic Carbon
				mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
[OR - Limit of Reporting				1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1
PFAS NEMP 2020 Drinking Water																				
PFAS NEMP 2020 Recreational Water																				
Lab Report No.	Field ID	Location Code	Date																	
EP1514030	WA0171-MW017	MW312	18/09/2015																	
523711	WA0171_MW017		11/11/2016																	
208619	0958_MW312_180326		26/03/2018		7				35	14		21					7.3	3.0	1.7	
223071	0958_MW312_190228		28/02/2019		11	<1			22	20		19					9.6	1.7	1.3	
EP1910968	0958_MW312_191024		24/10/2019	<1	10	<1	10	0.99	1.58	28		6.18	24	<10	166	108	8	1	2	28
EP2004509	0958_MW312_200505		5/05/2020	<1	3	<1	3	0.85	1.92	28		5.60	19	<5	190	88	16	3	2	24
EP2011490	0958_MW312_201021		21/10/2020	<1	8	<1	8	0.98	1.48	29		6.12	20	<2	146	32	8	2	2	24
EP2104665	0958_MW312_210428		28/04/2021	<1	21	<1	21	1.29	1.68	31	12.9	6.65	25	<5	126	14	7	2	3	24
EP1514030	WA0171-MW018	MW313	18/09/2015																	
523711	WA0171_MW018		11/11/2016																	
208793	0958_MW313_180329_H		29/03/2018																	
208793	0958_MW313_180329_M		29/03/2018		13				33	11		23					7.6	2.2	1.3	
223071	0958_MW313_190228		28/02/2019		13				20	19		16					12	1.9	1.2	
EP1910968	0958_MW313_191024		24/10/2019	<1	17	<1	17	0.90	1.30	20		6.60	13	<10	120	44	12	1	2	14
EP2004509	0958_MW313_200505		5/05/2020	<1	13	<1	13	0.85	1.92	21		6.73	15	<10	178	36	21	2	2	26
EP2011227	0958_MW313_201015		15/10/2020																	23
EP2104665	0958_MW313_210428	28/04/2021	<1	8	<1	8	0.78	1.58	22	33.9	6.40	13	<5	160	36	16	2	2	22	
206770-A	0958_BORE_1_180214	MW401	14/02/2018																	
208696	0958_Bore_1_180327		27/03/2018		12				40	-3.5		23					0.7	2.6	1.2	
222957	0958_Bore_1_190225		25/02/2019																	
EP1910968	0958_MW401_191024		24/10/2019	<1	201	<1	201	5.14	5.13	40	0.17	7.89	25	<1	286	<5	69	6	4	6
EP2002870	0958_MW401_200318		18/03/2020	<1	13	<1	13	1.39	1.43	40	1.45	6.62	26	<1	99	60	<1	3	2	4
EP2004453	0958_MW401_200504		4/05/2020	<1	176	<1	176	4.67	5.18	41	5.11	7.54	25	<1	250	14	70	6	4	6
EP2008767	0958_MW401_200819		19/08/2020	<1	195	<1	195	4.97	4.63	38	3.55	7.58	25	<1	267	25	59	6	4	4
EP2011227	0958_MW401_201015		15/10/2020																	6
EP2100912	0958_MW401_210128	28/01/2021	<1	13	<1	13	1.46	1.40	42	2.16	6.43	26	1	81	16	<1	3	1	6	
EP2104578	0958_MW401_210427	27/04/2021	<1	15	<1	15	1.48	1.40	42	2.81	6.24	26	<1	113	68	<1	3	1	5	
EP2108063	0958_MW401_210715	MW402	15/07/2021	<1	11	<1	11	1.40	1.23	42	6.46	6.10	24	<1	100	<5	<1	2	1	6
208696	0958_Bore_2_180327		27/03/2018		12				44	-3.6		26					0.8	2.4	0.9	
222957	0958_Bore_2_190225		25/02/2019																	
EP1911620	0958_MW402_191107		7/11/2019	<1	10	<1	10	1.80	1.88	56		5.95	37	1	132	<5	<1	3	1	7
EP2002870	0958_MW402_200318		18/03/2020	<1	8	<1	8	2.63	2.76	86	2.54	6.18	52	2	178	<5	<1	3	10	7
EP2004592	0958_MW402_200506		6/05/2020	<1	5	<1	5	6.64	5.78	232	6.98	5.96	118	<1	400	<5	2	6	2	8
EP2008767	0958_MW402_200819		19/08/2020	<1	82	<1	82	5.23	4.52	126	7.28	7.90	104	2	277	<5	<1	<1	<1	6
EP2011863	0958_MW402_201029		29/10/2020	<1	91	<1	91	5.89	5.11	143	7.08	7.80	113	2	322	<5	4	<1	<1	5
EP2104578	0958_MW402_210427	27/04/2021	<1	6	<1	6	3.31	3.26	113	0.76	5.80	65	<1	196	5	1	4	2	6	
222957	0958_GC19_190226	MW403	26/02/2019		<5			85	2.1		53					2.0	6.6	1.8		
EP1912058	0958_GC19_191118		18/11/2019	<1	4	<1	4	3.17	3.40	86	3.56	6.10	61	32	211	33	2	7	3	3
EP2002549	0958_MW403_200310		10/03/2020	<1	5	<1	5	3.35	3.39	99	0.56	6.00	60	22	214	29	2	7	4	9
EP2004700	0958_MW403_200508		8/05/2020	<1	4	<1	4	3.08	3.28	93	3.18	5.97	60	18	188	105	2	6	3	8
EP2008767	0958_MW403_200819		19/08/2020	<1	3	<1	3	2.97	3.10	89	2.20	6.20	57	19	186	35	1	6	3	2
EP2011863	0958_MW403_201029		29/10/2020	<1	2	<1	2	2.92	3.17	86	4.00	5.93	58	22	179	21	2	6	2	2
EP2100912	0958_MW403_210128		28/01/2021	<1	2	<1	2	3.04	3.17	91	1.99	5.83	58	21	170	8	2	6	2	3
EP2104964	0958_MW403_210505		5/05/2021	<1	3	<1	3	2.63	3.07	77	7.83	6.30	57	19	182	11	1	6	2	2
EP2108063	0958_MW403_210715	15/07/2021	<1	3	<1	3	3.11	2.95	94	2.62	5.55	56	19	199	62	1	5	2	2	
EP2011490	0958_MW103_201021	MW504	21/10/2020	<1	16	<1	16	1.01	1.12	18		6.33	11	9	196	356	9	2	1	14
EP2104665	0958_MW504_210428		28/04/2021	<1	7	<1	7	0.82	0.91	13	5.46	6.33	9	15	93	86	5	3	1	13
EP2011490	0958_MW311_201021	MW505	21/10/2020	<1	9	<1	9	0.95	1.23	22		6.26	16	7	124	260	7	1	4	20
EP2104666	0958_MW505_210428		28/04/2021	<1	15	<1	15	1.02	1.62	19	22.6	6.70	15	9	160	282	13	2	6	12

Table 2: Groundwater Bore Gauging Data

Date	Site ID	Bore Depth (mbTOC)	Screen Interval (mbTOC)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
23/10/2019	MW101I	23.5	19.78-22.78		11.839	73.5
4/05/2020	MW101I	23.5	19.78-22.78		12.264	73.5
21/10/2020	MW101I	23.5	19.78-22.78		Dry	73.5
28/04/2021	MW101I	23.5	19.78-22.78		12.401	73.5
4/05/2020	MW102D	43.4	39-42.5		12.148	73.41
21/10/2020	MW102D	43.4	39-42.5		12.183	73.41
28/04/2021	MW102D	43.4	39-42.5		12.47	73.41
25/10/2019	MW103S	8.325	5.5-9.5		7.045	73.509
25/10/2019	MW104I	22.9	7.5-10.5		11.860	73.74
7/05/2020	MW104I	22.9	7.5-10.5		12.238	73.74
21/10/2020	MW104I	22.9	7.5-10.5		12.322	73.74
28/04/2021	MW104I	22.9	7.5-10.5		12.45	73.74
25/10/2019	MW105D	42.3	39-42.5		11.980	73.79
7/05/2020	MW105D	42.3	39-42.5		12.392	73.79
21/10/2020	MW105D	42.3	39-42.5		12.205	73.79
28/04/2021	MW105D	42.3	39-42.5		12.543	73.79
25/10/2019	MW106S	11	6.8-10.8		6.520	71.54
7/05/2020	MW106S	11	6.8-10.8		6.870	71.54
23/10/2020	MW106S	11	6.8-10.8		6.948	71.54
27/04/2021	MW106S	11	6.8-10.8		7.18	71.54
23/10/2019	MW107S	9.5	5.5-9.5		Dry	71.60
6/05/2020	MW107S	9.5	5.5-9.5		Dry	71.60
23/10/2020	MW107S	9.5	5.5-9.5		Dry	71.60
28/04/2021	MW107S	9.5	5.5-9.5		Dry	71.60
23/10/2019	MW108S	9	5.0-9.0		Dry	70.90
6/05/2020	MW108S	9	5.0-9.0		Dry	70.90
23/10/2020	MW108S	9	5.0-9.0		Dry	70.90
28/04/2021	MW108S	9	5.0-9.0		Dry	70.90
25/10/2019	MW109S	10.3	5.8-10.1		7.625	73.45
5/05/2020	MW109S	10.3	5.8-10.1		8.206	73.45
21/10/2020	MW109S	10.3	5.8-10.1		7.966	73.45
28/04/2021	MW109S	10.3	5.8-10.1		9.15	73.45
25/10/2019	MW110S	10	6.5-10.0		8.070	73.74
5/05/2020	MW110S	10	6.5-10.0		8.592	73.74
21/10/2020	MW110S	10	6.5-10.0		8.411	73.74
28/04/2021	MW110S	10	6.5-10.0		9.15	73.74
24/10/2019	MW111S	9.5	6.5-9.5		8.120	73.87
5/05/2020	MW111S	9.5	6.5-9.5		Dry	73.87
15/10/2020	MW111S	9.5	6.5-9.5		Dry	73.87
28/04/2021	MW111S	9.5	6.5-9.5		Dry	73.87
24/10/2019	MW112S	10.5	7.5-10.5		8.280	73.69
4/05/2020	MW112S	10.5	7.5-10.5		8.809	73.69
21/10/2020	MW112S	10.5	7.5-10.5		11.006	73.69
28/04/2021	MW112S	10.5	7.5-10.5		8.79	74.06
24/10/2019	MW113S	9.6	6.5-9.5		8.464	73.79
4/05/2020	MW113S	9.6	6.5-9.5		8.942	73.79
21/10/2020	MW113S	9.6	6.5-9.5		8.884	73.79
28/04/2021	MW113S	9.6	6.5-9.5		9.185	73.79
25/10/2019	MW114S	8	5.0-8.0		7.940	73.68
5/05/2020	MW114S	8	5.0-8.0		Dry	73.68
14/10/2020	MW114S	8	5.0-8.0		7.45	73.68
28/04/2021	MW114S	8	5.0-8.0		Dry	73.68
25/10/2019	MW115S	8	5.0-8.0		5.170	70.79
5/05/2020	MW115S	8	5.0-8.0		5.776	70.79
21/10/2020	MW115S	8	5.0-8.0		5.668	70.79
28/04/2021	MW115S	8	5.0-8.0		6.17	70.79
25/10/2019	MW116S	11	8.0-11.0		9.460	74.43
6/05/2020	MW116S	11	8.0-11.0		9.998	74.43
21/10/2020	MW116S	11	8.0-11.0		9.826	74.43
28/04/2021	MW116S	11	8.0-11.0		10.18	74.43
25/10/2019	MW117I	23	21.3-23.3		13.680	74.19
6/05/2020	MW117I	23	21.3-23.3		13.886	74.19
21/10/2020	MW117I	23	21.3-23.3		13.926	74.19
28/04/2021	MW117I	23	21.3-23.3		14.1	74.19
25/10/2019	MW118D	43	41-43		13.760	74.19
6/05/2020	MW118D	43	41-43		13.962	74.19
21/10/2020	MW118D	43	41-43		13.988	74.19
28/04/2021	MW118D	43	41-43		14.17	74.19
24/10/2019	MW119S	13.1	10.1-13.1		Dry	74.06
6/05/2020	MW119S	13.1	10.1-13.1		12.732	74.06
21/10/2020	MW119S	13.1	10.1-13.1		Dry	74.06
28/04/2021	MW119S	13.1	10.1-13.1		12.49	74.06
24/10/2019	MW120I	23	19.94-22.94		14.820	74.84
6/05/2020	MW120I	23	19.94-22.94		15.014	74.84
21/10/2020	MW120I	23	19.94-22.94		15.051	74.84
28/04/2021	MW120I	23	19.94-22.94		15.19	74.84
24/10/2019	MW121D	42.8	39.8-42.8		14.965	73.96
6/05/2020	MW121D	42.8	39.8-42.8		15.033	73.96
21/10/2020	MW121D	42.8	39.8-42.8		15.185	73.96
28/04/2021	MW121D	42.8	39.8-42.8		15.34	73.96
25/10/2019	MW122S	13.5	10.5-13.5		13.530	75.84
5/05/2020	MW122S	13.5	10.5-13.5		13.722	75.84
21/10/2020	MW122S	13.5	10.5-13.5		13.568	75.84
28/04/2021	MW122S	13.5	10.5-13.5		13.72	75.84
25/10/2019	MW123I	23	20-23		19.130	76.03
5/05/2020	MW123I	23	20-23		15.808	76.03
14/10/2020	MW123I	23	20-23		16.1	76.03
28/04/2021	MW123I	23	20-23		16.36	76.03
25/10/2019	MW124D	42.5	39.5-42.5		16.590	75.87
21/10/2020	MW124D	42.5	39.5-42.5		16.721	75.87
28/04/2021	MW124D	42.5	39.5-42.5		16.83	75.87
24/10/2019	MW125S	18	14.25-17.25		14.567	74.88
7/05/2020	MW125S	18	14.25-17.25		14.771	74.88
23/10/2020	MW125S	18	14.25-17.25		14.425	74.88
27/04/2021	MW125S	18	14.25-17.25		15.03	74.88
24/10/2019	MW126I	36.5	33.5-36.5		13.000	73.50
7/05/2020	MW126I	36.5	33.5-36.5		13.213	73.50
23/10/2020	MW126I	36.5	33.5-36.5		13.284	73.50
27/04/2021	MW126I	36.5	33.5-36.5		13.45	73.50
24/10/2019	MW128D	50	47-50		16.688	74.40
7/05/2020	MW128D	50	47-50		16.793	74.40
23/10/2020	MW128D	50	47-50		16.897	74.40
27/04/2021	MW128D	50	47-50		17.02	74.40
24/10/2019	MW129S	18	15.3-18.3		15.650	73.51
7/05/2020	MW129S	18	15.3-18.3		15.892	73.51
23/10/2020	MW129S	18	15.3-18.3		15.99	73.51
27/04/2021	MW129S	18	15.3-18.3		16.1	73.51
24/10/2019	MW130D	36.5	33.5-36.5		15.335	72.77

Table 2: Groundwater Bore Gauging Data

Date	Site ID	Bore Depth (mbTOC)	Screen Interval (mbTOC)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
7/05/2020	MW130D	36.5	33.5-36.5	15.442	72.77	57.328
23/10/2020	MW130D	36.5	33.5-36.5	16.534	72.77	56.236
27/04/2021	MW130D	36.5	33.5-36.5	15.65	72.77	57.120
24/10/2019	MW131S	55.5	52.5-55.5	19.520	76.59	57.070
6/05/2020	MW131S	55.5	52.5-55.5	19.068	76.59	57.522
23/10/2020	MW131S	55.5	52.5-55.5	19.658	76.59	56.932
27/04/2021	MW131S	55.5	52.5-55.5	19.56	76.59	57.030
24/10/2019	MW132I	21	18.5-21.5	19.400	76.43	57.030
6/05/2020	MW132I	21	18.5-21.5	19.390	76.43	57.040
23/10/2020	MW132I	21	18.5-21.5	19.278	76.43	57.152
27/04/2021	MW132I	21	18.5-21.5	19.25	76.43	57.180
24/10/2019	MW133D	43.5	40.9-43.9	19.300	76.49	57.190
6/05/2020	MW133D	43.5	40.9-43.9	19.543	76.49	56.947
23/10/2020	MW133D	43.5	40.9-43.9	19.54	76.49	56.950
27/04/2021	MW133D	43.5	40.9-43.9	19.65	76.49	56.840
24/10/2019	MW134D	56	53-56	21.560	78.48	56.920
7/05/2020	MW134D	56	53-56	21.585	78.48	56.895
23/10/2020	MW134D	56	53-56	21.681	78.48	56.799
27/04/2021	MW134D	56	53-56	Dry	78.48	
24/10/2019	MW135I	24	21.1-23.6	20.850	77.67	56.820
7/05/2020	MW135I	24	21.1-23.6	20.953	77.67	56.717
23/10/2020	MW135I	24	21.1-23.6	20.96	77.67	56.710
27/04/2021	MW135I	24	21.1-23.6	21.05	77.67	56.620
24/10/2019	MW136D	44.9	41-44	21.370	78.24	56.870
7/05/2020	MW136D	44.9	41-44	21.398	78.24	56.842
23/10/2020	MW136D	44.9	41-44	22.286	78.24	55.954
27/04/2021	MW136D	44.9	41-44	21.570	78.24	56.670
25/10/2019	MW137S	8.7	4.7-8.7	Dry	73.12	
8/05/2020	MW137S	8.7	4.7-8.7	8.649	73.12	64.471
23/10/2020	MW137S	8.7	4.7-8.7	8.489	73.12	64.631
28/04/2021	MW137S	8.7	4.7-8.7	8.82	73.12	64.300
24/10/2019	MW138S	15	9.0-15.0	7.890	74.17	66.280
7/05/2020	MW138S	15	9.0-15.0	9.039	74.17	65.131
23/10/2020	MW138S	15	9.0-15.0	9.069	74.17	65.101
27/04/2021	MW138S	15	9.0-15.0	9.2	74.17	64.970
24/10/2019	MW139I	30	27.0-30.0	13.770	73.99	60.220
7/05/2020	MW139I	30	27.0-30.0	Dry	73.99	
23/10/2020	MW139I	30	27.0-30.0	13.986	73.99	60.004
27/04/2021	MW139I	30	27.0-30.0	14.1	73.99	59.890
24/10/2019	MW140D	54	51.5-54.5	13.580	73.90	60.320
7/05/2020	MW140D	54	51.5-54.5	16.020	73.90	57.880
23/10/2020	MW140D	54	51.5-54.5	13.816	73.90	60.084
27/04/2021	MW140D	54	51.5-54.5	13.95	73.90	59.950
25/10/2019	MW141S	16.5	13.5-16.5	10.900	74.36	63.460
10/03/2020	MW141S	16.5	13.5-16.5	10.920	74.36	63.440
7/05/2020	MW141S	16.5	13.5-16.5	10.970	74.36	63.390
23/10/2020	MW141S	16.5	13.5-16.5	11.09	74.36	63.270
28/01/2021	MW141S	16.5	13.5-16.5	11.15	74.36	63.210
28/04/2021	MW141S	16.5	13.5-16.5	11.2	74.36	63.160
15/07/2021	MW141S	16.5	13.5-16.5	11.32	74.36	63.040
25/10/2019	MW142S	15.5	12.4-15.4	13.620	76.34	62.720
10/03/2020	MW142S	15.5	12.4-15.4	13.670	76.34	62.670
7/05/2020	MW142S	15.5	12.4-15.4	13.721	76.34	62.619
29/10/2020	MW142S	15.5	12.4-15.4	13.804	76.34	62.536
28/01/2021	MW142S	15.5	12.4-15.4	13.82	76.34	62.520
28/04/2021	MW142S	15.5	12.4-15.4	14.35	76.34	61.990
15/07/2021	MW142S	15.5	12.4-15.4	13.86	76.34	62.480
25/10/2019	MW143S	18.5	14-18.5	Dry	75.81	
10/03/2020	MW143S	18.5	14-18.5	17.890	75.81	57.920
7/05/2020	MW143S	18.5	14-18.5	dry	75.81	
29/10/2020	MW143S	18.5	14-18.5	Dry	75.81	
28/01/2021	MW143S	18.5	14-18.5		75.81	75.810
28/04/2021	MW143S	18.5	14-18.5	Dry	75.81	
15/07/2021	MW143S	18.5	14-18.5		75.81	75.810
24/10/2019	MW301	10	7.0-10.0	8.590	74.547	65.957
4/05/2020	MW301	10	7.0-10.0	9.083	74.547	65.464
21/10/2020	MW301	10	7.0-10.0	9.003	74.547	65.544
28/04/2021	MW301	10	7.0-10.0	9.31	74.547	65.237
24/10/2019	MW302	10	7.0-10.0	8.762	74.712	65.950
4/05/2020	MW302	10	7.0-10.0	9.252	74.712	65.460
21/10/2020	MW302	10	7.0-10.0	9.173	74.712	65.539
28/04/2021	MW302	10	7.0-10.0	9.48	74.712	65.232
24/10/2019	MW303	10	7.0-10.0	8.625	74.574	65.949
4/05/2020	MW303	10	7.0-10.0	10.505	74.574	64.069
21/10/2020	MW303	10	7.0-10.0	9.046	74.574	65.528
28/04/2021	MW303	10	7.0-10.0	9.34	74.574	65.234
25/10/2019	MW304	9.5	6.5-9.5	7.760	74.094	66.334
5/05/2020	MW304	9.5	6.5-9.5	8.385	74.094	65.709
15/10/2020	MW304	9.5	6.5-9.5	8.08	74.094	66.014
28/04/2021	MW304	9.5	6.5-9.5	Dry	74.094	
25/10/2019	MW305	9	6.0-9.0	7.525	73.885	66.360
5/05/2020	MW305	9	6.0-9.0	Dry	73.885	
15/10/2020	MW305	9	6.0-9.0	7.94	73.885	65.945
28/04/2021	MW305	9	6.0-9.0	Dry	73.885	
25/10/2019	MW306	9	6.0-9.0	7.613	73.965	66.352
5/05/2020	MW306	9	6.0-9.0	Dry	73.965	
15/10/2020	MW306	9	6.0-9.0	7.93	73.965	66.035
28/04/2021	MW306	9	6.0-9.0	Dry	73.965	
25/10/2019	MW307	8.5	5.5-8.5	7.365	73.635	66.270
5/05/2020	MW307	8.5	5.5-8.5	Dry	73.635	
15/10/2020	MW307	8.5	5.5-8.5	6.67	73.635	66.965
28/04/2021	MW307	8.5	5.5-8.5	8.125	73.635	65.510
25/10/2019	MW308	9	6.0-9.0	7.390	73.691	66.301
5/05/2020	MW308	9	6.0-9.0	Dry	73.691	
15/10/2020	MW308	9	6.0-9.0	7.64	73.691	66.051
28/04/2021	MW308	9	6.0-9.0	Dry	73.691	
25/10/2019	MW309	9.5	6.5-9.5	7.600	73.899	66.299
5/05/2020	MW309	9.5	6.5-9.5	Dry	73.899	
15/10/2020	MW309	9.5	6.5-9.5	7.94	73.899	65.959
28/04/2021	MW309	9.5	6.5-9.5	Dry	73.899	
25/10/2019	MW310	9	6.0-9.0	7.505	73.806	66.301
5/05/2020	MW310	9	6.0-9.0	8.087	73.806	65.719
15/10/2020	MW310	9	6.0-9.0	7.77	73.806	66.036
28/04/2021	MW310	9	6.0-9.0	8.25	73.806	65.556
24/10/2019	MW312	9.5	6.5-9.5	8.303	74.541	66.238
5/05/2020	MW312	9.5	6.5-9.5	8.837	74.541	65.704
21/10/2020	MW312	9.5	6.5-9.5	8.627	74.541	65.914
28/04/2021	MW312	9.5	6.5-9.5	9.035	74.541	65.506

Table 2: Groundwater Bore Gauging Data

Date	Site ID	Bore Depth (mbTOC)	Screen Interval (mbTOC)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
24/10/2019	MW313	10.5	7.5-10.5	8.455	74.688	66.233
5/05/2020	MW313	10.5	7.5-10.5	8.984	74.688	65.704
15/10/2020	MW313	10.5	7.5-10.5	8.73	74.688	65.958
28/04/2021	MW313	10.5	7.5-10.5	9.18	74.688	65.508
18/11/2019	MW403	26	14-26	21.800	73.84	52.040
10/03/2020	MW403	26	14-26	21.070	73.84	52.770
8/05/2020	MW403	26	14-26	21.265	73.84	52.575
29/10/2020	MW403	26	14-26	21.144	73.84	52.696
28/01/2021	MW403	26	14-26	21.16	73.84	52.680
5/05/2021	MW403	26	14-26		73.84	
15/07/2021	MW403	26	14-26	21.26	73.84	52.580
21/10/2020	MW504	13	10.0-13.0	8.159	72.822	64.663
28/04/2021	MW504	13	10.0-13.0	7.908	72.822	64.914
21/10/2020	MW505	13	10.0-13.0	8.497	73.832	65.335
28/04/2021	MW505	13	10.0-13.0	8.915	73.832	64.917

Table 3: Groundwater Field Parameters

Date	Location ID	Sample ID	Comment	Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour?	Colour
23/10/2019	MW101I	0958_MW101_191023		HydraSleeve		22.8	2.7	125.1	81.25	5.72	52.3	
21/10/2020	MW101I		Dry									
4/05/2020	MW101I	0958_MW101_200504		HydraSleeve	21.3	1.38		247.6	146.7	8	-200.5	no
28/04/2021	MW101I	0958_MW101_210428		HydraSleeve	21	0.89		119.1	77.35	6.39	-62	
21/10/2020	MW102D	0958_MW102_201021		HydraSleeve	20.8	14.02		141.9	92.3	6.28	-61.1	
4/05/2020	MW102D	0958_MW102_200504		HydraSleeve	22.6	0.8		136.7	78.65	5.76	-199.8	no
28/04/2021	MW102D	0958_MW102D_210428		HydraSleeve	21	1.05		523.3	339.95	7.96	107	Cloudy,Clear
25/10/2019	MW103S	0958_MW103_191025		HydraSleeve	22.1			93.1	60.45	5.86	221.4	
7/05/2020	MW103S		Not found									
25/10/2019	MW104I	0958_MW104_191025		HydraSleeve	24.1			2923	1898	12.1	-51.2	
21/10/2020	MW104I	0958_MW104_201021		HydraSleeve	21	2.19		221.5	156	5.43	78.7	Cloudy
7/05/2020	MW104I	0958_MW104_200507		HydraSleeve	22.5	1.95		133.4	77	6.35	2.8	no
28/04/2021	MW104I	0958_MW104I_210428		HydraSleeve	24.8	1.17		125.7	126.3	8.02	5.8 ght sulfur	Clear,Yellow
25/10/2019	MW105D	0958_MW105_191025		HydraSleeve	24.1	1.77		219.8	143	8.02	121.4	
21/10/2020	MW105D	0958_MW105_201021		HydraSleeve	22.1	4.47		121.2	78.65	4.82	14.9	Yellow,Clear
7/05/2020	MW105D	0958_MW105_200507		HydraSleeve	20.8	2.19		341.9	204.6	5.04	14.9	no
28/04/2021	MW105D	0958_MW105D_210428		HydraSleeve	23.2	1.72		240.5	156	9.62	-1.2	Clear
25/10/2019	MW106S	0958_MW106_191025		HydraSleeve	21	0.99		222.8	156.65	2.86	294.1	
23/10/2020	MW106S	0958_MW106_201023		HydraSleeve	20.6	4.51		256.8	181.35	2.79	211.8	Brown
7/05/2020	MW106S	0958_MW106_200507		HydraSleeve	20.1	1.55		328.9	199.1	3.77	43.2	no
27/04/2021	MW106S	0958_MW106S_210427		Hydrasleeve	21.6	1.81		272	176.15	3.41	329.7	Brown
23/10/2019	MW107S		Dry									
23/10/2020	MW107S		Dry									
6/05/2020	MW107S		Dry									
28/04/2021	MW107S		Dry									
23/10/2019	MW108S		Dry									
23/10/2020	MW108S		Dry									
6/05/2020	MW108S		Dry									
28/04/2021	MW108S		Dry									
25/10/2019	MW109S	0958_MW109_191025	QC105 and QC205 taken here	Hydrasleeve	22.9	2.43		163.8	106.6	3.7	367.7	
21/10/2020	MW109S	0958_MW109_201021		HydraSleeve	20.4	1.01		143.6	93.6	3.51	277.2	Yellow,Brown
5/05/2020	MW109S	0958_MW109_200505		HydraSleeve	20.4	1.29		114.4	69.3	5.21	27.8	no
28/04/2021	MW109S	0958_MW109S_210428		Hydrasleeve	22.9	1.3		127.6	83.2	4.68	163.9	Clear
25/10/2019	MW110S	0958_MW110_191025		HydraSleeve	23.1	3.8		112.3	76.05	3.79	234.4	
21/10/2020	MW110S	0958_MW110_201021		HydraSleeve	20.5	2.07		126.5	81.9	3.68	248	Brown
5/05/2020	MW110S	0958_MW110_200505		HydraSleeve	20.1	1.63		108.1	65.45	4.79	8.2	no
28/04/2021	MW110S	0958_MW110S_210428		Hydrasleeve	22	2.3		109.2	70.85	4.66	219.2	Brown
24/10/2019	MW111S		Bore Dry									
15/10/2020	MW111S		Dry									
5/05/2020	MW111S		Dry									
28/04/2021	MW111S		Dry									
21/10/2020	MW112S	0958_MW112_201021		HydraSleeve	20.5	6.22		137.4	89.05	3.24	267.2	Yellow
24/10/2019	MW112S	0958_MW112_5_191024		HydraSleeve	23.7	3.19		113.2	73.45	3.65	324.5	
4/05/2020	MW112S	0958_MW112_200504		HydraSleeve	20.6	2.89		125.1	74.8	6.94	-125	no
28/04/2021	MW112S			HydraSleeve	22.9	9.39		177.5	115.7	3.83	319.3	Cloudy,Brown
24/10/2019	MW113S	0958_MW113	101 201 DUP and TRIPPLICATE taken here	HydraSleeve	26.5	1.98		165.8	107.9	3.62	343.6	Clear
21/10/2020	MW113S	0958_MW113_201021		HydraSleeve	20.1	2.55		161.7	104.65	3.22	276.1	Yellow
4/05/2020	MW113S	0958_MW113_200504		HydraSleeve	20.4	2.98		147.3	88.55	4.44	-141.1	no
28/04/2021	MW113S	0958_MW113S_210428		Hydrasleeve	22.1	1.35		133.5	87.1	4.03	303.9	Clear
25/10/2019	MW114S		Bore Dry									
14/10/2020	MW114S	0958_MW114_201014	Not enough water for hydrasleeve	HandBailing	22.9	5.11		180	122.2	6.15	2325	Brown
5/05/2020	MW114S		Dry									
28/04/2021	MW114S		dry									
25/10/2019	MW115S	0958_MW115_191025	QC104 QC204	HydraSleeve	25.1	1.35		187.7	121.55	3.12	237.2	
21/10/2020	MW115S	0958_MW115_201021		HydraSleeve	21.3	2.19		196.5	109.85	3.36	255.1	
5/05/2020	MW115S	0958_MW115_200505		HydraSleeve	22.5	1.58		142.1	81.95	4.11	21.1	no
28/04/2021	MW115S	0958_MW115S_210428		Hydrasleeve	23.7	1.11		136.2	88.4	4.03	272.7	Brown
25/10/2019	MW116S	0958_MW116_191025		HydraSleeve	21.3	2.78		130.2	91	3.34	187.8	
21/10/2020	MW116S	0958_MW116_201021		HydraSleeve	19.7	2.08		146.3	94.9	3.35	175.9	Yellow
6/05/2020	MW116S	0958_MW116_200506		HydraSleeve	18.7	3.25		147.6	92.4	4.2	-29.2	no
28/04/2021	MW116S	0958_MW116S_210428		Hydrasleeve	21	2.26		150.4	97.5	3.99	273.3	Brown
25/10/2019	MW117I		Unable to sample									
21/10/2020	MW117I	0958_MW117_201021		HydraSleeve	20.4	1.17		124.1	80.6	4.87	50.6	Clear
6/05/2020	MW117I	0958_MW117_200506		HydraSleeve	18.6	1.5		110.1	69.3	4.85	-7	no
28/04/2021	MW117I	0958_MW117I_210428		Hydrasleeve	21	1.83		129.1	83.85	5.18	33.7	Green
25/10/2019	MW118D	0958_MW118_191025		HydraSleeve	21.7	0.6		190.6	131.95	5.01	85.7	
21/10/2020	MW118D	0958_MW118_201021		HydraSleeve	20.8	1.99		200.1	141.05	4.97	51	Clear
6/05/2020	MW118D	0958_MW118_200506		HydraSleeve	18.7	1.24		200.6	125.4	5.03	13.3	no
28/04/2021	MW118D	0958_MW118D_210428		Hydrasleeve	21.3	1.3		212.5	137.8	5.01	4.8	Cloudy
24/10/2019	MW119S	0958_MW119_191024		HydraSleeve	21	2.8		94.5	66.3	3.51	157.6	Clear
21/10/2020	MW119S		Dry									
6/05/2020	MW119S	0958_MW119_200506		HydraSleeve	18	2.18		141.9	89.65	3.9	-3.6	no
28/04/2021	MW119S	0958_MW119S_210428		Hydrasleeve	22.2	2.55		126.2	81.9	4.1	320.2	Brown
24/10/2019	MW120I	0958_MW120_191024		HydraSleeve	22.8	0.78		93.9	61.1	4.02	139.1	
21/10/2020	MW120I	0958_MW120_201021		HydraSleeve	21	2.68		92.2	59.8	4.36	94.1	Yellow
6/05/2020	MW120I	0958_MW120_200506		HydraSleeve	15.8	0.97		76.2	51.15	4.29	-54	no
28/04/2021	MW120I	0958_MW120I_210428		Hydrasleeve	23	2.86		100	65	5.22	108.4	Brown
24/10/2019	MW121D	0958_MW121_191024		HydraSleeve	23.1	0.77		321	208.65	6.06	-43.9	
21/10/2020	MW121D	0958_MW121_201021		HydraSleeve	21.3	0.83		295.6	191.75	5.52	-9.9	Clear,Black
6/05/2020	MW121D	0958_MW121_200506		HydraSleeve	17.5	1.94		255.9	164.45	5.03	-21.8	no
28/04/2021	MW121D	0958_MW121D_210428		Hydrasleeve	22.9	3.1		162	105.3	5.94	-44.8	Clear
25/10/2019	MW122S	0958_MW122_191025		HydraSleeve	21.4	3.13		124.4	86.45	3.56	209.5	Amber
21/10/2020	MW122S	0958_MW122_201021		HydraSleeve	22.5	7.01		143.8	93.6	3.45	247.7	Yellow,Brown
5/05/2020	MW122S	0958_MW122_200505		HydraSleeve	20.1	1.76		155.7	94.6	4.3	50.1	no
28/04/2021	MW122S	0958_MW122S_210428	Insufficient volume for total collection	Hydrasleeve	4.44	4.78		158.9	103.25	4.42	293.5	Clear
25/10/2019	MW123I	0958_MW123_191025		HydraSleeve	20.3	0.86		132.3	94.25	4.44	63.7	
14/10/2020	MW123I	0958_MW123_201014	Qc101, 201	HydraSleeve	21.1	4.08		199.8	140.4	5.75	-134	Sulfur
5/05/2020	MW123I	0958_MW123_200505		HydraSleeve	20.4	0.72		150.2	90.75	5.15	16.7	no
28/04/2021	MW123I	0958_MW123I_210428		Hydrasleeve	22	1.7		188.2	122.2	5.47	-41.5	Sulfuric
25/10/2019	MW124D	0958_MW124_191025		HydraSleeve	20.1	0.53		180	129.53	5.25	91.3	
21/10/2020	MW124D	0958_MW124_201021		HydraSleeve	21.4	0.86		190.8	124.15	4.67	167.5	Cloudy
5/05/2020	MW124D		Damaged									
28/04/2021	MW124D	0958_MW124D_210428		Hydrasleeve	20.9	0.52		413.1	267.8	6.02	47.3	Clear
23/10/2020	MW125S	0958_MW125_201023		HydraSleeve	19.9	0.79		111.6	72.8	4.54	55.2	Clear,Yellow
24/10/2019	MW125S	0958_MW125_5_191024		HydraSleeve	21.4	1.23		93.2	65	5.08	46.1	
7/05/2020	MW125S	0958_MW125_200507		HydraSleeve	19	1.59		92.3	57.2	5.21	2.9	no
27/04/2021	MW125S	0958_MW125S_210427		HydraSleeve	21	1.38		126.2	81.9	4.99	37.2	Brown
23/10/2020	MW126I	0958_MW126_201023		HydraSleeve	20.2	0.83		180.3	128.7	4.82	46.3	Clear
24/10/2019	MW126I	0958_MW126_I_191024		HydraSleeve	20.2	1.3		166.3	118.95	5.65	26.3	
7/05/2020	MW126I	0958_MW126_200507		HydraSleeve	19.2	1.15		174.7	107.8	5.28	-4.2	no
27/04/2021	MW126I	0958_MW126I_210427		HydraSleeve	22.4	1.41						

Table 3: Groundwater Field Parameters

24/10/2019	MW131D	0958_MW131_191024		HydraSleeve	19.4	1.26	140.4	102.05	5.02	59.1		
23/10/2020	MW131D	0958_MW131_201023		HydraSleeve	20.1	1.61	156.3	111.8	4.93	40.2		Cloudy
6/05/2020	MW131D	0958_MW131_200506		HydraSleeve	18.5	1.28	176.3	110.55	5.46	-86.4	no	Clear
27/04/2021	MW131D	0958_MW131D_210427		HydraSleeve	23.3	1.19	203.5	132.5	5.48	-26.9		Clear
24/10/2019	MW132I	0958_MW132_191024		HydraSleeve	19.9	1.45	95.1	68.25	4.61	5.8		
23/10/2020	MW132I	0958_MW132_201023		HydraSleeve	20	0.91	205.5	133.25	4.95	9.7		Clear
27/04/2021	MW132I	0958_MW132I_210427		HydraSleeve	21.5	0.73	164.6	107.25	5.05	27.7		Clear
24/10/2019	MW133D	0958_MW133_191024		HydraSleeve	19.2	1.12	166.3	122.5	4.92	-3.8		
23/10/2020	MW133D	0958_MW133_201023		HydraSleeve	19.7	2.42	107.3	77.35	4.79	19.5		Clear
6/05/2020	MW133D	0958_MW133_200506		HydraSleeve	17.5	2.52	177.1	113.85	5.31	-106.2	no	Clear
27/04/2021	MW133D	0958_MW133D_210427		HydraSleeve	25.3	1.51	160.8	104.65	5.54	-5		Clear
24/10/2019	MW134D	0958_MW134_191024		HydraSleeve	19.1	1	167.9	122.85	5.13	-24.6		
23/10/2020	MW134D	0958_MW134_201023		HydraSleeve	19.6	1.49	171.8	124.8	4.96	24.8		Clear
7/05/2020	MW134D	0958_MW134_200507		HydraSleeve	18	2.89	168.6	107.25	5.13	3.1	no	Clear
27/04/2021	MW134D		Dry									
24/10/2019	MW135I	0958_MW135_191024		HydraSleeve	19.8	1.83	165.2	118.95	4.64	158.9		
23/10/2020	MW135I	0958_MW135_201023		HydraSleeve	18.9	2.53	193.4	142.35	4.93	52.7		Yellow
7/05/2020	MW135I	0958_MW135_200507		HydraSleeve	18	2	177.2	112.75	4.99	-25.9	no	Clear
27/04/2021	MW135I	0958_MW135I_210427		HydraSleeve	20.2	1.71	226.7	147.55	4.98	35.8		Brown
24/10/2019	MW136D	0958_MW136_191024		HydraSleeve	18.8	1.77	138.3	102.5	4.67	-10.4		
23/10/2020	MW136D	0958_MW136_201023		HydraSleeve	19.1	0.8	158.3	115.7	5.11	21.1		Clear
7/05/2020	MW136D	0958_MW136_200507		HydraSleeve	17.8	1.91	153.1	97.35	5.13	-15.9	no	Clear
27/04/2021	MW136D	0958_MW136D_270421		HydraSleeve	21.2	3.37	190.9	124.5	5.51	-17.9		Clear
25/10/2019	MW137S		Dry									
23/10/2020	MW137S	0958_MW137_201023		HydraSleeve	22.2	10.88	233.9	152.1	3.43	236.5		Brown
8/05/2020	MW137S	0958_MW137_200508		HydraSleeve	20.5	8.15	190.5	135.85	4.5	64.7	no	Brown
28/04/2021	MW137S	0958_MW137S_210428		HydraSleeve	24.1	3.25	216.6	141.05	4.59	172.7		Brown
24/10/2019	MW138S	0958_MW138_191024		HydraSleeve	23	0.78	244.7	165.75	3.44	183.9		Brown
23/10/2020	MW138S	0958_MW138_201023		HydraSleeve	18.9	0.99	322	209.3	3.74	170.2		Black, Yellow
7/05/2020	MW138S	0958_MW138_200507		HydraSleeve	18.6	1.35	271.2	169.95	4.33	-23.8	no	Brown
27/04/2021	MW138S	0958_MW138S_210427		HydraSleeve	22.6	1.44	323.5	210.6	4.47	231.9		Brown
24/10/2019	MW139I	0958_MW139_191024		HydraSleeve	22.8	0.59	180.5	123.5	4.91	72.5		
23/10/2020	MW139I	0958_MW139_201023		HydraSleeve	18.6	2.04	206.6	134.55	5.73	-42		Clear
7/05/2020	MW139I	0958_MW139_200507		HydraSleeve	18.4	1.14	183.4	115.5	5.41	-45.4	no	Clear
27/04/2021	MW139I	0958_MW139I_210427		HydraSleeve	22.5	0.92	226.9	147.55	6.33	36		Clear
24/10/2019	MW140D	0958_MW140_191024		HydraSleeve	21.4	2.66	391.5	270.4	6.47	-43.1		
23/10/2020	MW140D	0958_MW140_201023		HydraSleeve	19.1	6.14	410	299.65	5.42	-13.7		
7/05/2020	MW140D	0958_MW140_200507		HydraSleeve	17.5	1.89	376.9	242	5.88	-31.1	no	Clear
27/04/2021	MW140D	0958_MW140D_210427		HydraSleeve	20.4	0.79	676	442	6.99	-46.4		Clear
25/10/2019	MW141S	0958_MW141_191025		HydraSleeve	20.7	1.01	186.4	131.95	3.76	96.8		
10/03/2020	MW141S	0958_MW141_200310	QC101 and QC201 taken	HydraSleeve	32.2	3.49	237.4	146.9	5.04	170.6	No	
23/10/2020	MW141S	0958_MW141_201023		HydraSleeve	20.1	1.55	177.2	126.75	4.03	19.3		Clear
28/01/2021	MW141S	0958_MW141_210128		HydraSleeve	21.5	2.61	147.6		5.53	245.6	no	Yellow
7/05/2020	MW141S	0958_MW141_200507		HydraSleeve	18.9	1.34	195.4	121.55	5	24.7	no	Clear, Brown
19/08/2020	MW141S	0958_MW141_200819		HydraSleeve	186	213	1935	143.65	517	1302	no	Yellow, Brown
28/04/2021	MW141S	0958_MW141S_210428		HydraSleeve	22.2	1.69	188.4	122.85	4.01	67.4	Slight	Brown
15/07/2021	MW141S	0958_MW141S_210715	QC101/201	HydraSleeve	18.3	2.76	263.4	170.95	4.45	20.5	no	Yellow, Clear
25/10/2019	MW142S	0958_MW142_191025		HydraSleeve	21.8	3.21	221.4	152.75	3.68	259.1		
10/03/2020	MW142S	0958_MW142_200310		Hand Bailor	30.9	4.26	291.3	170.3	4.21	168.2	No	
29/10/2020	MW142S	0958_MW142_201029		HydraSleeve	20.4	21.11	285	185.25	4.73	84.5		
28/01/2021	MW142S	0958_MW142_210128		HydraSleeve	20.7	2.2	274.7		3.91	302.1	no	Yellow
7/05/2020	MW142S	0958_MW142_200507		HydraSleeve	18.7	2.61	238.3	148.5	4.39	33	no	Brown
19/08/2020	MW142S	0958_MW142_200819		HydraSleeve	182	458	2793	2093	465	324	no	Brown
28/04/2021	MW142S	0958_MW142S_210428		HydraSleeve	26.5	4.02	289	187.85	3.64	337		Brown
15/07/2021	MW142S	0958_MW142S_210715		HydraSleeve	18.2	3.5	232.4	150.8	4.12	262.6	no	Clear, Brown
25/10/2019	MW143		Dry									
25/10/2019	MW143S	0958_MW143_191025										
10/03/2020	MW143S	0958_MW143_200310		HydraSleeve	29.8	2.65	294.9	176.15	4.58	211.9	No	
29/10/2020	MW143S		Dry									
28/01/2021	MW143S	-	Bore dry									
7/05/2020	MW143S		Dry									
19/08/2020	MW143S		Dry									
28/04/2021	MW143S		Dry									
15/07/2021	MW143S		Dry									
24/10/2019	MW301	0958_MW301_191024		HydraSleeve	24.5	3.66	137.1	89.05	3.68	295.1		
4/05/2020	MW301	0958_MW301_200504		HydraSleeve	22.5	2.62	183.7	106.15	4.12	-47.4	no	Brown
21/10/2020	MW301	0958_MW301_201021		HydraSleeve	20.6	2.65	208.1	135.2	3.04	265.1		Yellow
28/04/2021	MW301	0958_MW301_210428		HydraSleeve	22.2	4.46	227.7	148.2	3.61	302.6		Clear
24/10/2019	MW302	0958_MW302_191024		HydraSleeve	23.4	5.36	174.4	113.1	3.46	365.7		
4/05/2020	MW302	0958_MW302_200504		HydraSleeve	25.3	5.14	251.1	143.55	4.86	-25.6	no	Brown
21/10/2020	MW302	0958_MW302_201021		HydraSleeve	20.8	4.36	141.3	91.65	3.55	193.8		Yellow
28/04/2021	MW302	0958_MW302_210428		HydraSleeve	22.3	4.76	141	91.65	4.02	194.4		Clear
24/10/2019	MW303	0958_MW303_191024		HydraSleeve	21.4	6.26	146.7	95.55	4.02	284.8		
4/05/2020	MW303	0958_MW303_200504		HydraSleeve	24	3.48	142.4	79.75	4.38	-34.6	no	Brown
21/10/2020	MW303	0958_MW303_201021		HydraSleeve	20.9	4.47	148.8	96.85	3.29	250.6		Yellow
28/04/2021	MW303	0958_MW303_210428		HydraSleeve	22.3	4.06	149.5	96.85	3.94	268.5		Clear
25/10/2019	MW304	0958_MW304_191025		HydraSleeve	24.2	1.88	255.3	165.75	4.76	238.6		
5/05/2020	MW304	0958_MW304_200505		HydraSleeve	22.3	2.12	286.5	166.65	5.51	41.9	no	Brown
15/10/2020	MW304	0958_MW304_201015		HandBailing	20.9	4.17	217.6	153.4	4.98	201.7		Cloudy, Brown
28/04/2021	MW304		DRY									
25/10/2019	MW305	0958_MW305_191025		HydraSleeve	22.3	2.41	157.9	102.7	4.44	244.9		
5/05/2020	MW305		Dry									
15/10/2020	MW305	0958_MW305_201015	Not enough water for hydrasleeve	HandBailing	21.5	2.43	164	114.4	4.69	188.1		Brown
28/04/2021	MW305		Dry									
25/10/2019	MW306	0958_MW306_191025		HydraSleeve	22.6	0.51	215.1	139.75	3.87	278.1		
5/05/2020	MW306		Dry									
15/10/2020	MW306	0958_MW306_201015	Not enough water for hydrasleeve	HandBailing	20.9	3.8	160.9	113.75	4.98	183.6		Cloudy, Yellow
28/04/2021	MW306		Dry									
25/10/2019	MW307	0958_MW307_191025		HydraSleeve	28		131.8	85.8	4.28	329.8		
5/05/2020	MW307		Dry									
15/10/2020	MW307	0958_MW307_201015		HydraSleeve	20.5	4.79	123.3	87.75	5.92	104.2		Cloudy
28/04/2021	MW307	0958_MW307_210428		HydraSleeve	24.4	2.5	158.4	102.7	5.13	179.5		Cloudy, Brown
25/10/2019	MW308	0958_MW308_191025		HydraSleeve	25.6	3.23	134.5	87.75	4.08	335.5		
5/05/2020	MW308		Damaged - filled in with bitumen									
15/10/2020	MW308	0958_MW308_201015		HydraSleeve	20.6	4.3	391.3	277.55	6.89	161.5		Cloudy
28/04/2021	MW308		Dry									
25/10/2019	MW309	0958_MW309_191025		HydraSleeve	27	4.22	143.4	92.95	5.13	379.5		
5/05/2020	MW309		Dry									
15/10/2020	MW309	0958_MW309_201015		HydraSleeve	21.8	1.94	144.7	1001	4.95	196.6		Cloudy, Yellow
28/04/2021	MW309		Dry									
25/10/2019	MW310	0958_MW310_191025		HydraSleeve	28.1	1	241.7	157.4	4.68	3		

Table 3: Groundwater Field Parameters

4/05/2020	MW401	0958_MW401_200504	Tap	20	1.8	399	242.55	5.89	-178.1	no	Clear
19/08/2020	MW401	0958_MW401_200819	Tap	20.6	2.75	493.3	312	7.43	-186	no	Clear
15/10/2020	MW401	0958_MW401_201015	Abstraction bore	Tap	23.8	2.78	251.2	167.05	6.43	-46.6	Clear
28/01/2021	MW401	0958_MW401_210128	Sampled from tap	Tap	25.1	2.9	256.6		6.32	-12	no Cloudy
27/04/2021	MW401	0958_MW401_210427	Tap	30.5	1.37	141.3	91.65	6.23	-52.5		Clear, Yellow
15/07/2021	MW401	0958_MW401_210715	Tap	19.2	5.21	155	100.75	5.65	43.3	no	Clear
7/11/2019	MW402	0958_MW402_191107	Production bore tap	Tap	28.5	0.85	409.7	211.2	5.57	-78.7	
18/03/2020	MW402	0958_MW402_200318	Tap	23.2	2.19	200.6	114.4	6.5	-104	No	
6/05/2020	MW402	0958_MW402_200506	Sampled from bore pump		18.6	2.16	651	407	5.17	-7.8	no Clear
19/08/2020	MW402	0958_MW402_200819	QC101/201	Tap	23.6	1.43	533	351	7.7	-71	no Clear
29/10/2020	MW402	0958_MW402_201029	Abstraction bore		29.7	1.22	611	396.5	5.99	148	Clear
Access to bore denied by Broadspectrum due to presence of Amoebae in water											
28/01/2021	MW402		Tap	25.2	1.21	380.4	247.65	5.98	140.2	Organic	Clear
27/04/2021	MW402	0958_MW402_210427	Unable to unscrew the lid at end of tap/pipe to sample								
15/07/2021	MW402										
18/11/2019	MW403	0958_MW403_191118	HydraSleeve	24.9	1.15	361.2	234	5.88	92.8		
10/03/2020	MW403	0958_MW403_200310	HydraSleeve	36.9	18.12	451.7	271.7	5.02	173.5	No	
8/05/2020	MW403	0958_MW403_200508	HydraSleeve	19.7	8.91	341.9	247	5.03	57.3		
19/08/2020	MW403	0958_MW403_200819	HydraSleeve	183	217	3021	22555	574	-157	no	Brown
29/10/2020	MW403	0958_MW403_201029	HydraSleeve	19.7	1.25	366.2	237.5	4.36	127.2		
28/01/2021	MW403	0958_MW403_210128	HydraSleeve	20.6	2	373.8		5.13	225.7	no	Cloudy, Clear
5/05/2021	MW403	0958_MW403_210505	Hydrasleeve	18	1.63	422.7		7.2	83.8		Clear
15/07/2021	MW403	0958_MW403_210715	HydraSleeve	18.1	1.66	346.1	224.9	5.05	218.3	no	Clear, Brown
21/10/2020	MW504	0958_MW103_201021	HydraSleeve	22.3	1.5	125.1	85.8	5	133.1		Cloudy, Brown
28/04/2021	MW504	0958_MW504_210428	Hydrasleeve	23.8	1.27	61	39.65	5.8	130.1		Cloudy, Brown
21/10/2020	MW505	0958_MW311_201021	HydraSleeve	21.3	1.24	118.6	83.2	4.53	205.4		Brown, Clear
28/04/2021	MW505	0958_MW505_210428	Hydrasleeve	24.5	0.81	158.4	102.7	5.65	218.2		Clear

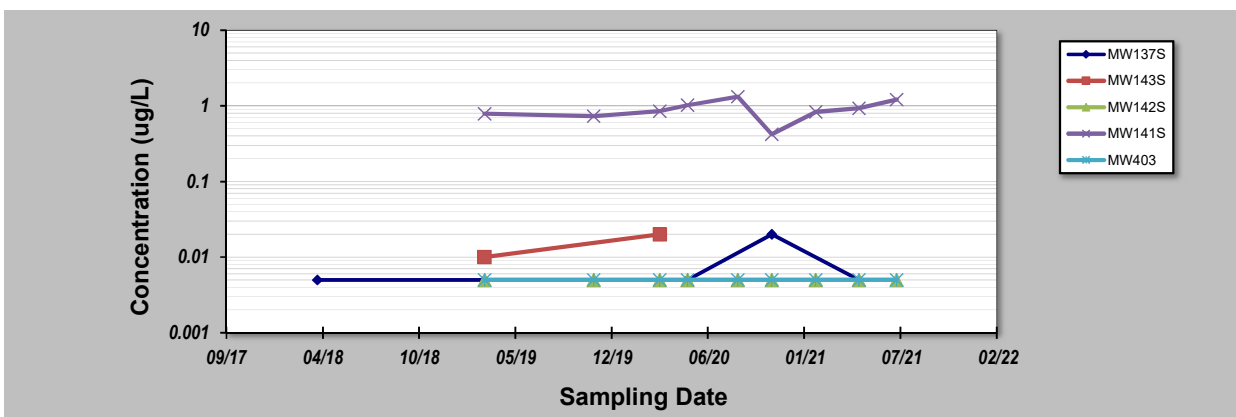
Table 4: Tap Water Field Parameters

Date	Location ID	Sample_ID	Sample Method	Temp (Co)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour	Sample Colour
24/10/2019	POT101	0958_POT101_191024	Tap	22.2		361.8	235.3	6.4	185.7		
10/03/2020	POT101	0958_POT101_200310	Tap	32.8	3.79	471.7	266.5	6.34	32.2	No	Clear
5/05/2020	POT101	0958_POT101_200505	Tap	23.2	3.49	515	291.5	7.22	14.4	no	Clear
19/08/2020	POT101	0958_POT101_200819	Tap	17.2	4.51	443	338	7.38	-6.8	no	Clear
14/10/2020	POT101	0958_POT101_201014	Tap	22.9	3.83	533	364	776	202.5		Clear
28/01/2021	POT101	0958_POT101_210128	Tap	25	5.08	514	234	6.44	142	no	Clear
27/04/2021	POT101	0958_POT101_210427	Tap	26.3	3.47	275.5	179.4	6.41	22.3		Clear
15/07/2021	POT101	0958_POT101_210715	Tap	15.7	7.49	579.8	377	5.94	214.7	no	Clear
25/10/2019	POT102	0958_POT102_191025	Tap	28.6	3.57	383	232.7	5.98	255.7		
10/03/2020	POT102	0958_POT102_200310	Tap	32	4.57	563	325	6.67	85.7	No	Clear
6/05/2020	POT102	0958_POT102_200506	Tap	16	4.21	679	451	5.54	-67.3	no	Clear
19/08/2020	POT102	0958_POT102_200819	Tap	18.6	7.53	463.7	343.85	7.91	53.7	no	Clear
21/10/2020	POT102	0958_POT102_201021	Tap	25.2	4.98	551	357.5	6.2	190.9		Clear
28/01/2021	POT102	0958_POT102_210128	Tap	24.4	5.65	557	262	7.17	193.9	no	Clear
27/04/2021	POT102	0958_POT102_210427	Tap	29.2	3	522	338	7.54	142.8		Clear
15/07/2021	POT102	0958_POT102_210715	Tap	16.4	6.25	346.1	224.9	6.32	366.2	no	Clear
25/10/2019	POT103	0958_POT103_191025	Tap	26.7	0.15	434.8	282.75	6.53	212.5		
10/03/2020	POT103	0958_POT103_200310	Tap	33.8	82	718	396	5.7	57.2	No	Clear
5/05/2020	POT103	0958_POT103_200505	Tap	20.8	4.96	494.2	295.35	7.23	21.8	no	Clear
19/08/2020	POT103	0958_POT103_200819	Tap	13.1	9.12	407	341.9	8.2	103.5	no	Clear
14/10/2020	POT103	0958_POT103_201014	Tap	22.7	4.76	529	357.5	6.66	358.9		Cloudy
28/01/2021	POT103	0958_POT103_210128	Tap	26.5	3.64	617	315	6.62	199.9	no	Clear
27/04/2021	POT103	0958_POT103_210427	Tap	27.2	3.26	644	416	7.49	93.2		Clear
15/07/2021	POT103	0958_POT103_210715	Tap	14.8	9.26	623	403	6.34	630.3	no	Clear
25/10/2019	POT104	0958_POT104_191025	Tap	24.4	5.36	477.1	310.05	6.18	685.6		
10/03/2020	POT104	0958_POT104_200310	Tap	33.2	4.25	489.3	275.6	6.38	70.1	No	Clear
5/05/2020	POT104	0958_POT104_200505	Tap	23.2	3.08	512	291.5	6.84	-53.7	no	Clear
19/08/2020	POT104	0958_POT104_200819	Tap	15.9	8.2	431.9	339.95	7.97	122	no	Clear
14/10/2020	POT104	0958_POT104_201014	Tap	23.3	7.31	524	351	6.68	321.9		Clear
28/01/2021	POT104	0958_POT104_210128	Tap	24.5	5.34	614	290	6.66	227	no	Clear
27/04/2021	POT104	0958_POT104_210427	Tap	32.9	4.65	710	461.5	6.52	151.5		Clear
15/07/2021	POT104	0958_POT104_210715	Tap	19.8	6.71	639	416	6.16	446	no	Clear
24/10/2019	POT105	0958_POT105_191024	Tap	24.5		337.7	219.7	5.94	259		
18/03/2020	POT105	0958_POT105_200318	Tap	28.5	1.98	418.8	215.05	6.77	162.2	No	Clear
5/05/2020	POT105	0958_POT105_200505	Tap	20.9	4.17	471.2	281.05	6.92	-6.3	no	Clear
19/08/2020	POT105	0958_POT105_200819	Tap	15.4	6.67	418.8	332.15	8.05	-38.3	no	Cloudy
14/10/2020	POT105	0958_POT105_201014	Tap	23.2	6.4	529	357.5	7.1	217.2		Cloudy
28/01/2021	POT105	0958_POT105_210128	Tap	30.5	4.6	559	286	6.59	160.9	no	Clear
27/04/2021	POT105	0958_POT105_210427	Tap	34.3	2.97	287.1	186.55	6.46	144.6		Clear
15/07/2021	POT105	0958_POT105_210715	Tap	16.6	7.85	328.4	213.2	6.04	227.4	no	Clear

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Offsite	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW137S	MW143S	MW142S	MW141S	MW403		
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)						
1	30-Mar-18	0.005						
2	12-Mar-19	0.005	0.01	0.005	0.79	0.005		
3	25-Oct-19			0.005	0.73	0.005		
4	10-Mar-20		0.02	0.005	0.85	0.005		
5	7-May-20	0.005		0.005	1.02	0.005		
6	19-Aug-20			0.005	1.32	0.005		
7	29-Oct-20	0.02		0.005	0.42	0.005		
8	28-Jan-21			0.005	0.83	0.005		
9	28-Apr-21	0.005		0.005	0.93	0.005		
10	15-Jul-21			0.005	1.21	0.005		
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.84	0.47	0.00	0.30	0.00		
Mann-Kendall Statistic (S):		2	1	0	12	0		
Confidence Factor:		59.2%		46.0%	87.0%	46.0%		
Concentration Trend:		No Trend		Stable	No Trend	Stable		



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

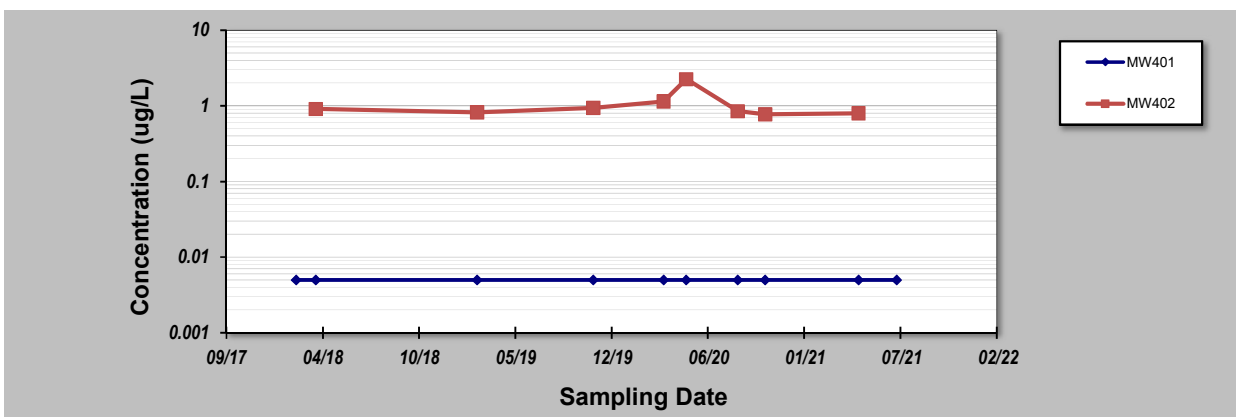
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Abstraction Bores	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	MW401	MW402				
PFOS+PFHXS CONCENTRATION (ug/L)							
1	14-Feb-18	0.005					
2	27-Mar-18	0.005	0.91				
3	25-Feb-19	0.005	0.82				
4	24-Oct-19	0.005	0.94				
5	18-Mar-20	0.005	1.15				
6	4-May-20	0.005	2.26				
7	19-Aug-20	0.005	0.85				
8	15-Oct-20	0.005	0.77				
9	27-Apr-21	0.005	0.8				
10	15-Jul-21	0.005					
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.00	0.47				
Mann-Kendall Statistic (S):		0	-6				
Confidence Factor:		45.6%	72.6%				
Concentration Trend:		Stable	Stable				



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

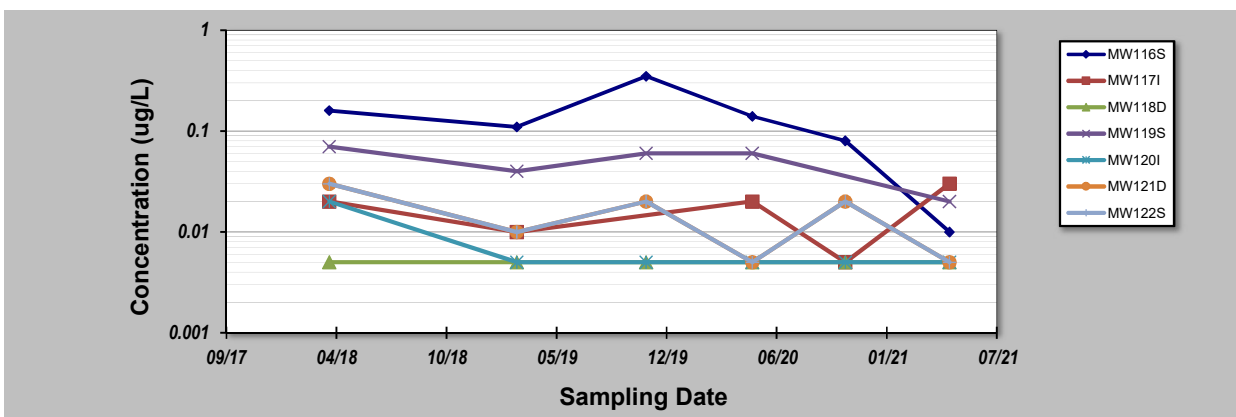
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Airside perimeter	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW116S	MW117I	MW118D	MW119S	MW120I	MW121D	MW122S
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)						
1	28-Mar-18	0.16	0.02	0.005	0.07	0.02	0.03	0.03
2	4-Mar-19	0.11	0.01	0.005	0.04	0.005	0.01	0.01
3	25-Oct-19	0.35		0.005	0.06	0.005	0.02	0.02
4	5-May-20	0.14	0.02	0.005	0.06	0.005	0.005	0.005
5	21-Oct-20	0.08	0.005	0.005		0.005	0.02	0.02
6	28-Apr-21	0.01	0.03	0.005	0.02	0.005	0.005	0.005
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Coefficient of Variation:		0.81	0.57	0.00	0.40	0.82	0.67	0.67
Mann-Kendall Statistic (S):		-9	1	0	-5	-5	-7	-7
Confidence Factor:		93.2%	50.0%	39.3%	82.1%	76.5%	86.4%	86.4%
Concentration Trend:		Prob. Decreasing	No Trend	Stable	Stable	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

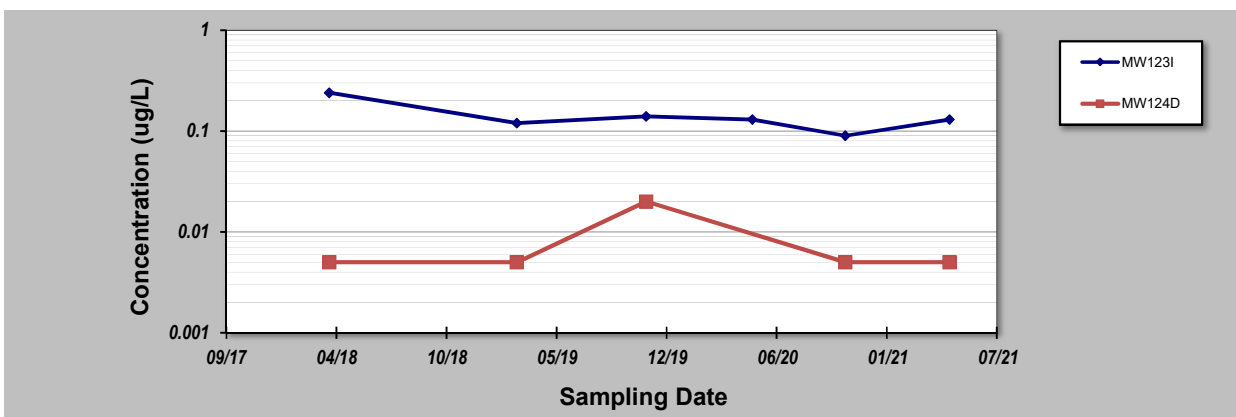
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Airside perimeter	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)					
1	28-Mar-18	0.24	0.005				
2	4-Mar-19	0.12	0.005				
3	25-Oct-19	0.14	0.02				
4	5-May-20	0.13					
5	21-Oct-20	0.09	0.005				
6	28-Apr-21	0.13	0.005				
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Coefficient of Variation:		0.36	0.84				
Mann-Kendall Statistic (S):		-6	0				
Confidence Factor:		81.5%	40.8%				
Concentration Trend:		Stable	Stable				



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

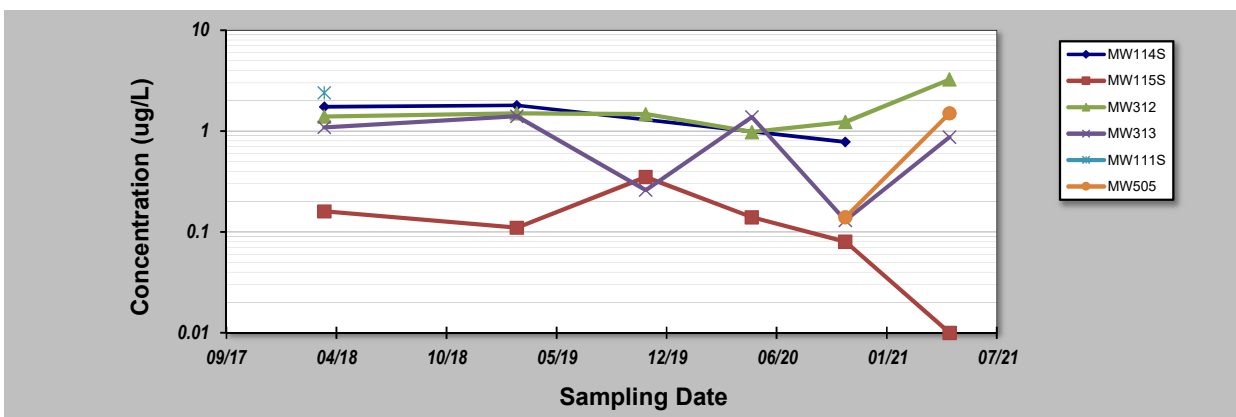
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Onsite secondary sources	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW114S	MW115S	MW312	MW313	MW111S	MW505
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)					
1	19-Mar-18	1.74	0.16	1.39	1.09	2.39	
2	4-Mar-19	1.8	0.11	1.5	1.4		
3	24-Oct-19		0.35	1.47	0.26		
4	4-May-20		0.14	0.98	1.38		
5	21-Oct-20	0.78	0.08	1.23	0.13		0.14
6	28-Apr-21		0.01	3.25	0.87		1.5
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Coefficient of Variation:		0.40	0.81	0.50	0.64		1.17
Mann-Kendall Statistic (S):		-1	-9	1	-5		1
Confidence Factor:			93.2%	50.0%	76.5%		
Concentration Trend:			Prob. Decreasing	No Trend	Stable		



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

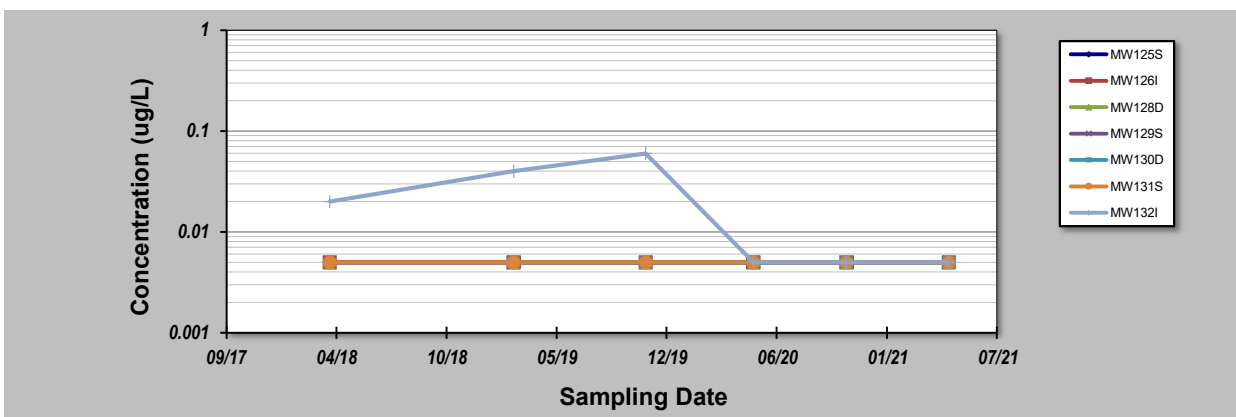
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Site Boundary	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW125S	MW126I	MW128D	MW129S	MW130D	MW131S	MW132I
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)						
1	29-Mar-18	0.005	0.005	0.005	0.005		0.005	0.02
2	26-Feb-19	0.005	0.005	0.005	0.005	0.005	0.005	0.04
3	24-Oct-19	0.005	0.005	0.005	0.005	0.005	0.005	0.06
4	7-May-20	0.005	0.005	0.005	0.005	0.005	0.005	0.005
5	23-Oct-20	0.005	0.005	0.005	0.005	0.005	0.005	0.005
6	27-Apr-21	0.005	0.005	0.005	0.005	0.005	0.005	0.005
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Coefficient of Variation:		0.00	0.00	0.00	0.00	0.00	0.00	1.02
Mann-Kendall Statistic (S):		0	0	0	0	0	0	-6
Confidence Factor:		39.3%	39.3%	39.3%	39.3%	40.8%	39.3%	81.5%
Concentration Trend:		Stable	Stable	Stable	Stable	Stable	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

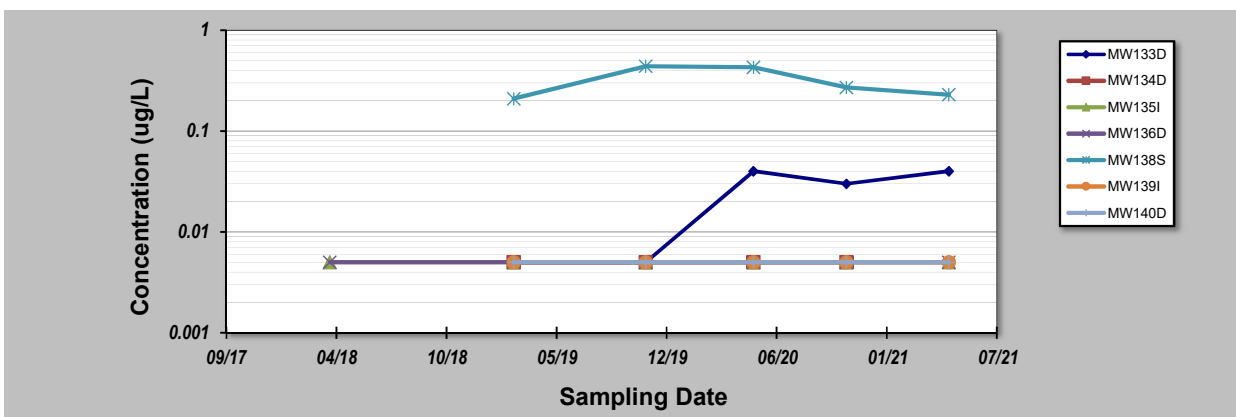
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Site Boundary	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW133D	MW134D	MW135I	MW136D	MW138S	MW139I	MW140D
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)						
1	29-Mar-18			0.005	0.005			
2	26-Feb-19	0.005	0.005	0.005	0.005	0.21	0.005	0.005
3	24-Oct-19	0.005	0.005	0.005	0.005	0.44	0.005	0.005
4	7-May-20	0.04	0.005	0.005	0.005	0.43	0.005	0.005
5	23-Oct-20	0.03	0.005	0.005	0.005	0.27	0.005	0.005
6	27-Apr-21	0.04		0.005	0.005	0.23	0.005	0.005
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Coefficient of Variation:		0.74	0.00	0.00	0.00	0.35	0.00	0.00
Mann-Kendall Statistic (S):		6	0	0	0	-2	0	0
Confidence Factor:		88.3%	37.5%	39.3%	39.3%	59.2%	40.8%	40.8%
Concentration Trend:		No Trend	Stable	Stable	Stable	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

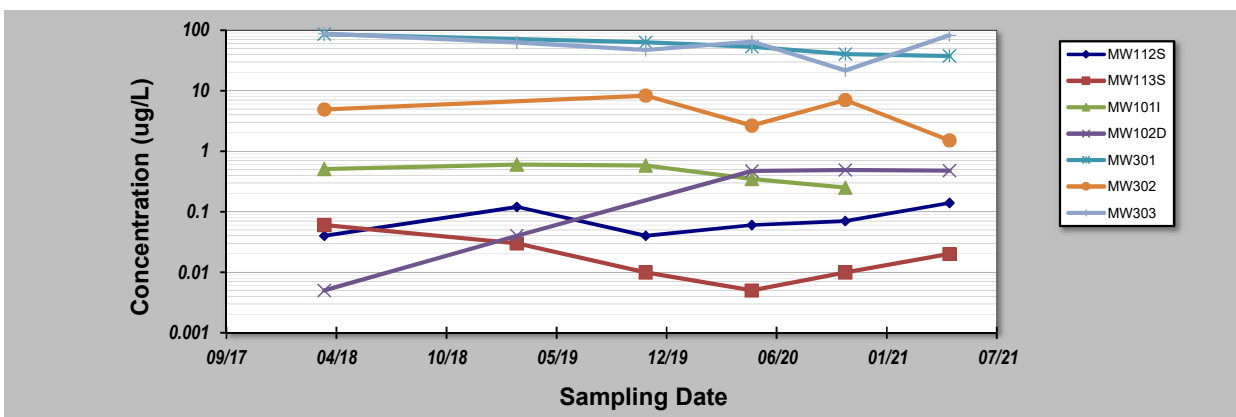
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Former Fuel Farm	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW112S	MW113S	MW101I	MW102D	MW301	MW302	MW303
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)						
1	19-Mar-18	0.04	0.06	0.51	0.005	86.2	4.9	88
2	4-Mar-19	0.12	0.03	0.6	0.04			63
3	24-Oct-19	0.04	0.01	0.58		63.5	8.3	46.9
4	4-May-20	0.06	0.005	0.35	0.47	53.3	2.66	64.9
5	21-Oct-20	0.07	0.01	0.25	0.49	40.5	7.04	21.6
6	28-Apr-21	0.14	0.02		0.48	37.6	1.51	82.8
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Coefficient of Variation:		0.54	0.91	0.33	0.85	0.35	0.59	0.40
Mann-Kendall Statistic (S):		8	-6	-6	8	-10	-4	-3
Confidence Factor:		89.8%	81.5%	88.3%	95.8%	99.2%	75.8%	64.0%
Concentration Trend:		No Trend	Stable	Stable	Increasing	Decreasing	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

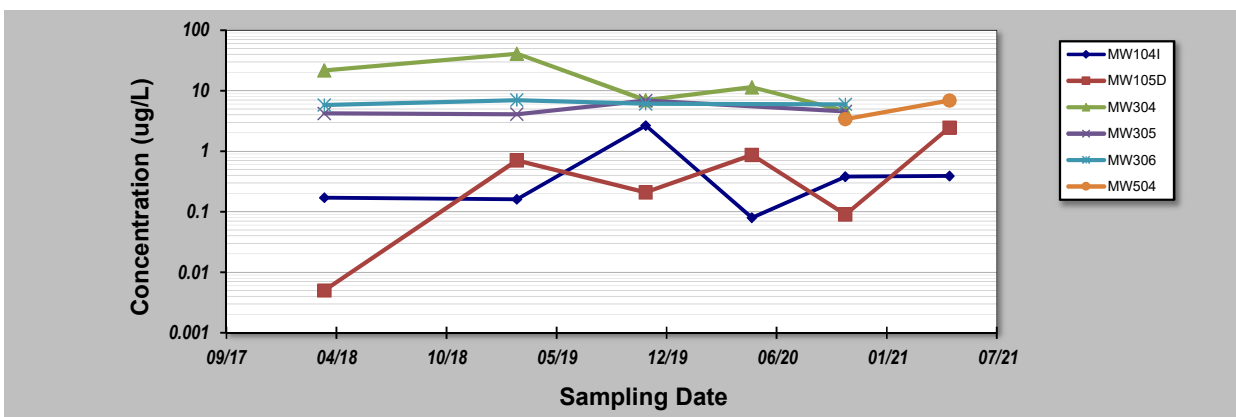
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Fire House & Refuelling Area	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW104I	MW105D	MW304	MW305	MW306	MW504
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)					
1	19-Mar-18	0.17	0.005	21.7	4.2	5.8	
2	4-Mar-19	0.16	0.71	41	4.1	7	
3	24-Oct-19	2.65	0.21	6.96	6.86	6.1	
4	4-May-20	0.08	0.87	11.4			
5	21-Oct-20	0.38	0.09	4.6	4.54	5.97	3.39
6	28-Apr-21	0.39	2.46				6.9
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Coefficient of Variation:		1.56	1.27	0.87	0.26	0.09	0.48
Mann-Kendall Statistic (S):		3	7	-6	2	0	1
Confidence Factor:		64.0%	86.4%	88.3%	62.5%	37.5%	
Concentration Trend:		No Trend	No Trend	Stable	No Trend	Stable	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

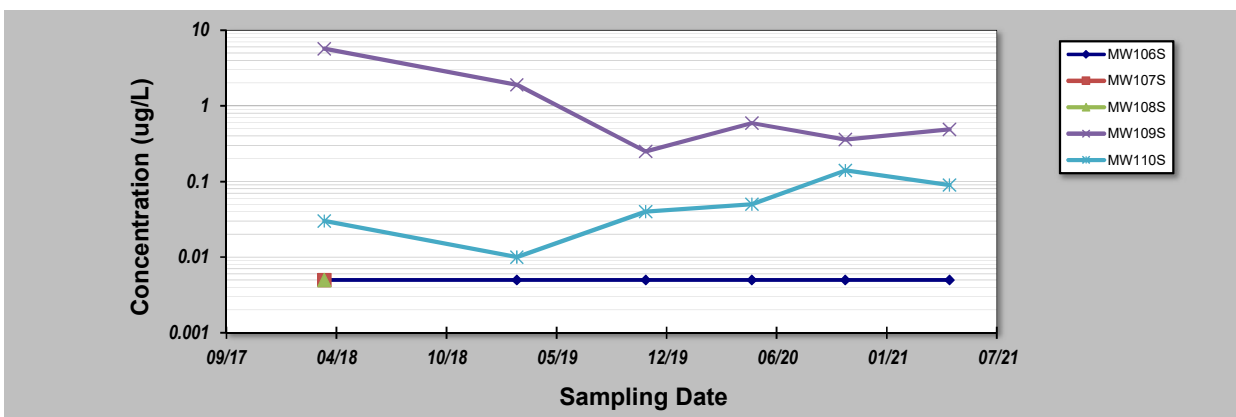
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Landfills	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	MW106S	MW107S	MW108S	MW109S	MW110S	
		PFOS+PFHXS CONCENTRATION (ug/L)					
1	19-Mar-18	0.005	0.005	0.005	5.7	0.03	
2	4-Mar-19	0.005			1.9	0.01	
3	24-Oct-19	0.005			0.25	0.04	
4	4-May-20	0.005			0.59	0.05	
5	21-Oct-20	0.005			0.36	0.14	
6	28-Apr-21	0.005			0.49	0.09	
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Coefficient of Variation:		0.00			1.37	0.79	
Mann-Kendall Statistic (S):		0			-7	11	
Confidence Factor:		39.3%			86.4%	97.2%	
Concentration Trend:		Stable			No Trend	Increasing	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

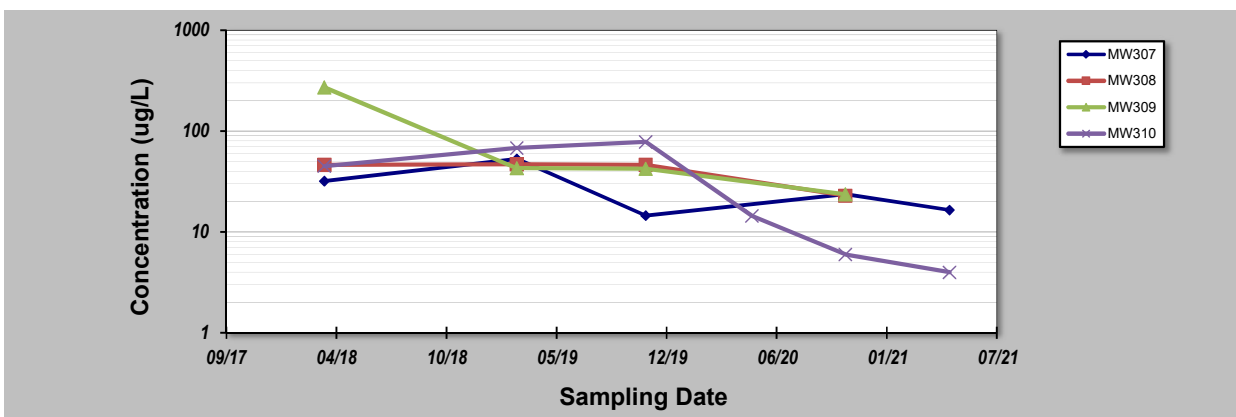
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Powerhouse	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW307	MW308	MW309	MW310			
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)						
1	19-Mar-18	31.8	46.2	271	45			
2	4-Mar-19	53	47	43	68			
3	24-Oct-19	14.5	46.3	42.2	78.1			
4	4-May-20				14.4			
5	21-Oct-20	23.7	22.9	23.6	5.98			
6	28-Apr-21	16.5			3.98			
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Coefficient of Variation:		0.56	0.29	1.24	0.90			
Mann-Kendall Statistic (S):		-4	-2	-6	-9			
Confidence Factor:		75.8%	62.5%	95.8%	93.2%			
Concentration Trend:		Stable	Stable	Decreasing	Prob. Decreasing			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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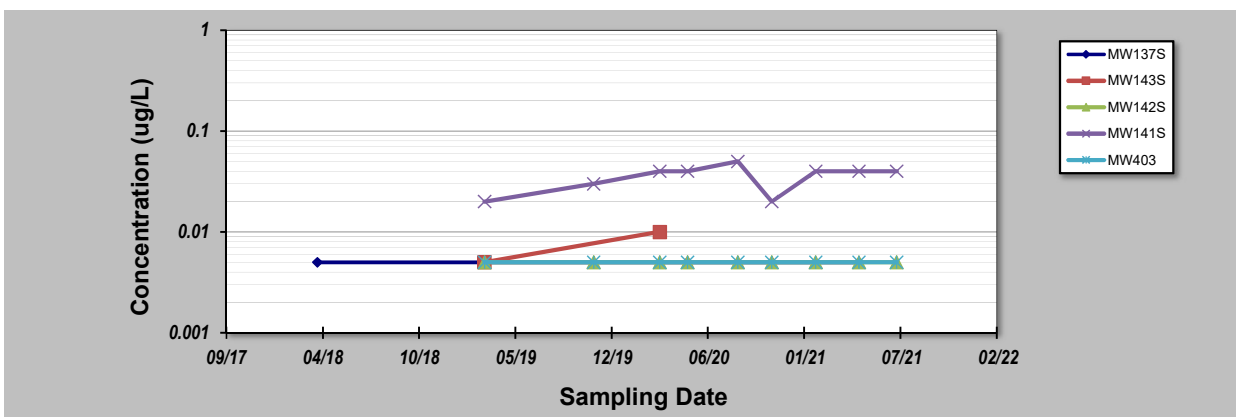
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Offsite	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	MW137S	MW143S	MW142S	MW141S	MW403	
		PFOA CONCENTRATION (ug/L)					
1	30-Mar-18	0.005					
2	12-Mar-19	0.005	0.005	0.005	0.02	0.005	
3	25-Oct-19			0.005	0.03	0.005	
4	10-Mar-20		0.01	0.005	0.04	0.005	
5	7-May-20	0.005		0.005	0.04	0.005	
6	19-Aug-20			0.005	0.05	0.005	
7	29-Oct-20	0.005		0.005	0.02	0.005	
8	28-Jan-21			0.005	0.04	0.005	
9	28-Apr-21	0.005		0.005	0.04	0.005	
10	15-Jul-21			0.005	0.04	0.005	
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.00	0.47	0.00	0.29	0.00	
Mann-Kendall Statistic (S):		0	1	0	11	0	
Confidence Factor:		40.8%		46.0%	84.6%	46.0%	
Concentration Trend:		Stable		Stable	No Trend	Stable	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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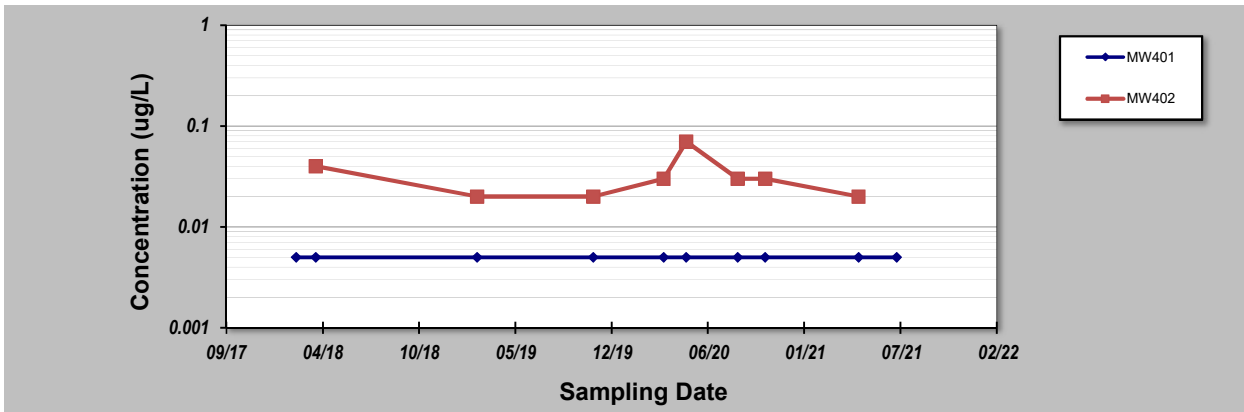
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Abstraction Bores	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW401	MW402					
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	14-Feb-18	0.005						
2	27-Mar-18	0.005	0.04					
3	25-Feb-19	0.005	0.02					
4	24-Oct-19	0.005	0.02					
5	18-Mar-20	0.005	0.03					
6	4-May-20	0.005	0.07					
7	19-Aug-20	0.005	0.03					
8	15-Oct-20	0.005	0.03					
9	27-Apr-21	0.005	0.02					
10	15-Jul-21	0.005						
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.00	0.51					
Mann-Kendall Statistic (S):		0	-2					
Confidence Factor:		45.6%	54.8%					
Concentration Trend:		Stable	Stable					



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

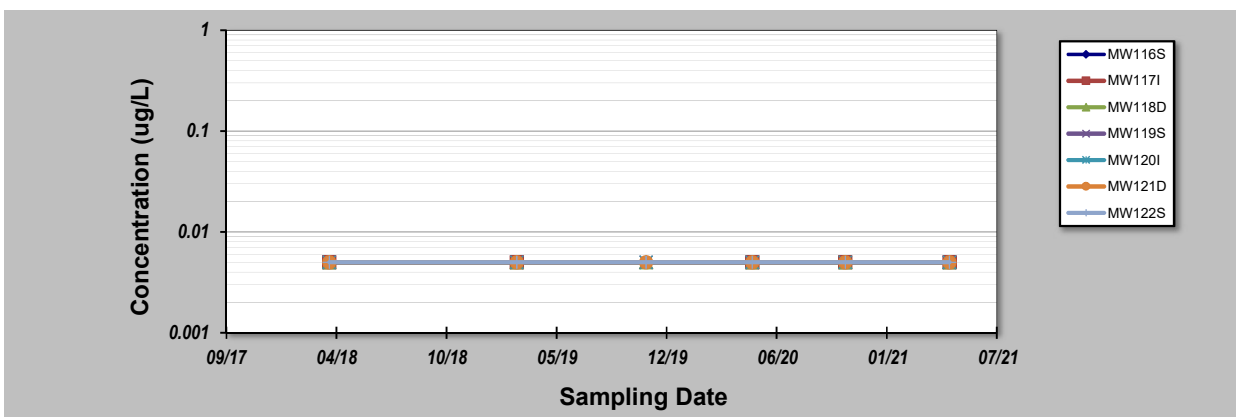
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Airside perimeter	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW116S	MW117I	MW118D	MW119S	MW120I	MW121D	MW122S
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	28-Mar-18	0.005	0.005	0.005	0.005	0.005	0.005	0.005
2	4-Mar-19	0.005	0.005	0.005	0.005	0.005	0.005	0.005
3	25-Oct-19	0.005		0.005	0.005	0.005	0.005	0.005
4	5-May-20	0.005	0.005	0.005	0.005	0.005	0.005	0.005
5	21-Oct-20	0.005	0.005	0.005		0.005	0.005	0.005
6	28-Apr-21	0.005	0.005	0.005	0.005	0.005	0.005	0.005
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mann-Kendall Statistic (S):		0	0	0	0	0	0	0
Confidence Factor:		39.3%	40.8%	39.3%	40.8%	39.3%	39.3%	39.3%
Concentration Trend:		Stable	Stable	Stable	Stable	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

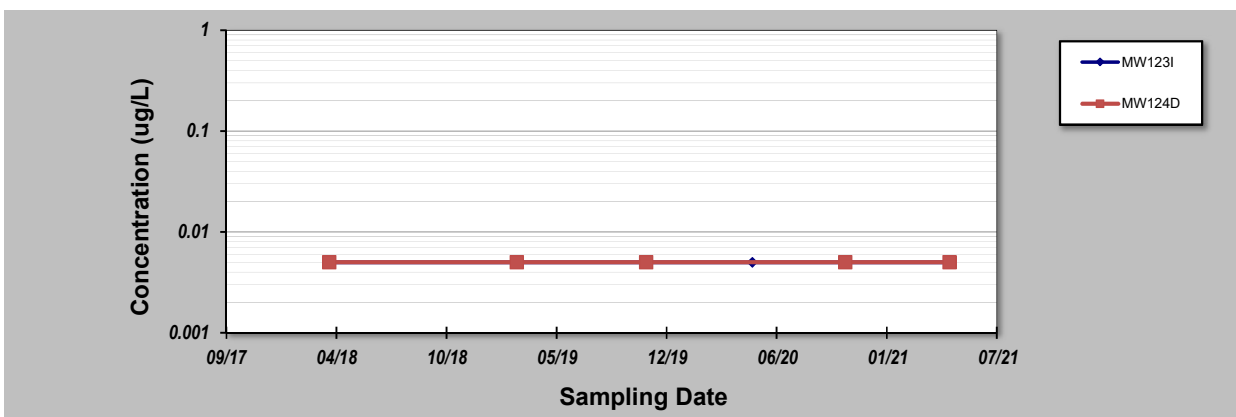
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Airside perimeter	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)					
1	28-Mar-18	0.005	0.005				
2	4-Mar-19	0.005	0.005				
3	25-Oct-19	0.005	0.005				
4	5-May-20	0.005					
5	21-Oct-20	0.005	0.005				
6	28-Apr-21	0.005	0.005				
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.00	0.00				
Mann-Kendall Statistic (S):		0	0				
Confidence Factor:		39.3%	40.8%				
Concentration Trend:		Stable	Stable				



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

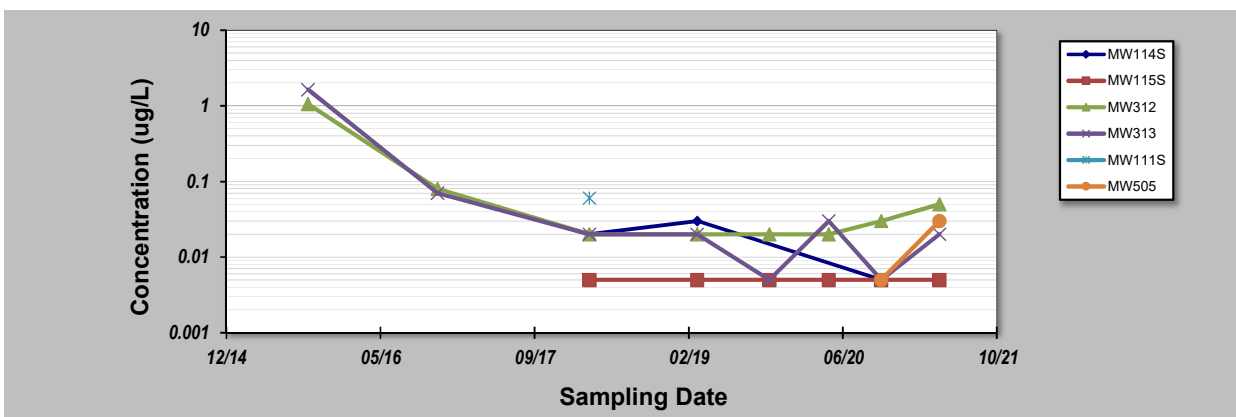
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Onsite secondary sources	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	MW114S	MW115S	MW312	MW313	MW111S	MW505
PFOA CONCENTRATION (ug/L)							
1	18-Sep-15			1.06	1.64		
2	11-Nov-16			0.08	0.07		
3	19-Mar-18	0.02	0.005	0.02	0.02	0.06	
4	4-Mar-19	0.03	0.005	0.02	0.02		
5	24-Oct-19		0.005	0.02	0.005		
6	4-May-20		0.005	0.02	0.03		
7	21-Oct-20	0.005	0.005	0.03	0.005		0.005
8	28-Apr-21		0.005	0.05	0.02		0.03
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.69	0.00	2.24	2.53		1.01
Mann-Kendall Statistic (S):		-1	0	-4	-14		1
Confidence Factor:			39.3%	64.0%	94.6%		
Concentration Trend:			Stable	No Trend	Prob. Decreasing		



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

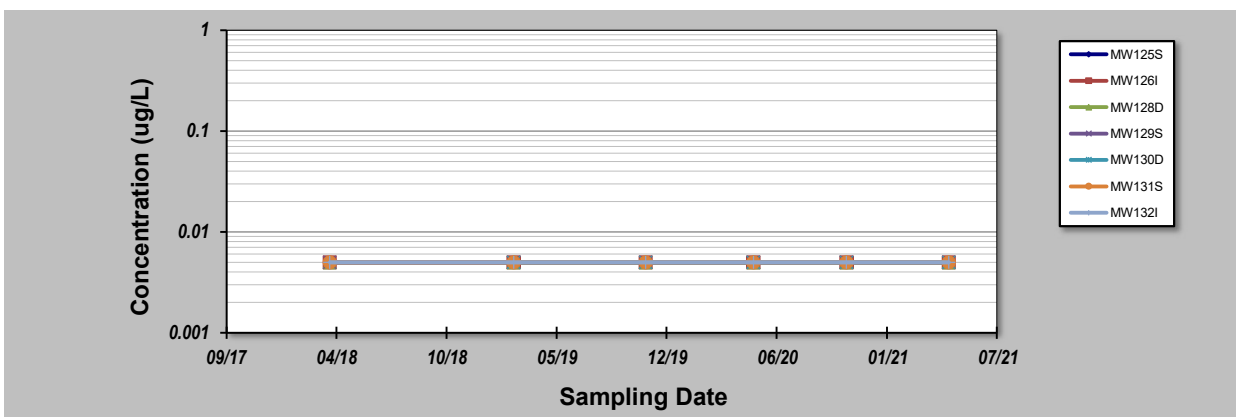
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Site Boundary	Constituent: PFOS+PFHxS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW125S	MW126I	MW128D	MW129S	MW130D	MW131S	MW132I
Sampling Event	Sampling Date	PFOS+PFHXS CONCENTRATION (ug/L)						
1	29-Mar-18	0.005	0.005	0.005	0.005		0.005	0.005
2	26-Feb-19	0.005	0.005	0.005	0.005	0.005	0.005	0.005
3	24-Oct-19	0.005	0.005	0.005	0.005	0.005	0.005	0.005
4	7-May-20	0.005	0.005	0.005	0.005	0.005	0.005	0.005
5	23-Oct-20	0.005	0.005	0.005	0.005	0.005	0.005	0.005
6	27-Apr-21	0.005	0.005	0.005	0.005	0.005	0.005	0.005
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mann-Kendall Statistic (S):		0	0	0	0	0	0	0
Confidence Factor:		39.3%	39.3%	39.3%	39.3%	40.8%	39.3%	39.3%
Concentration Trend:		Stable	Stable	Stable	Stable	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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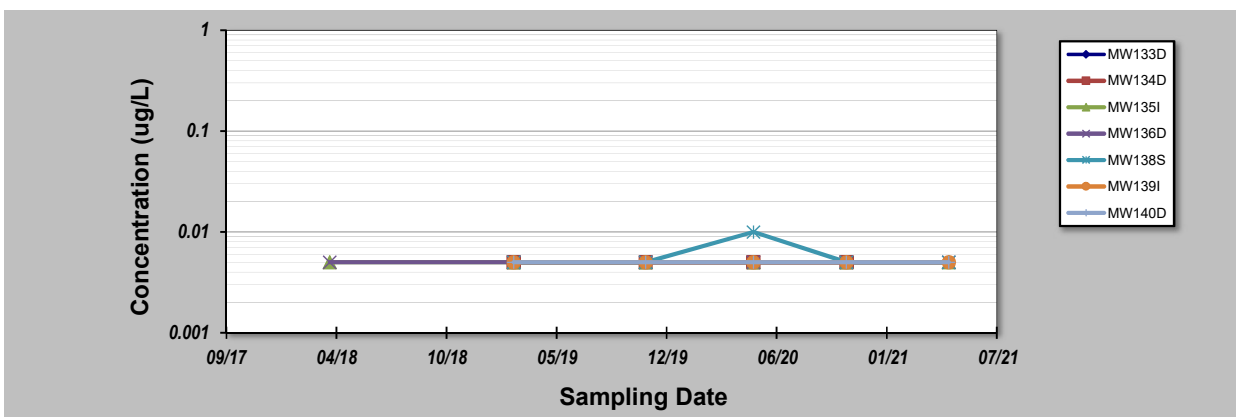
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Site Boundary	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:	MW133D	MW134D	MW135I	MW136D	MW138S	MW139I	MW140D
--------------------	--------	--------	--------	--------	--------	--------	--------

Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	29-Mar-18			0.005	0.005			
2	26-Feb-19	0.005	0.005	0.005	0.005	0.005	0.005	0.005
3	24-Oct-19	0.005	0.005	0.005	0.005	0.005	0.005	0.005
4	7-May-20	0.005	0.005	0.005	0.005	0.01	0.005	0.005
5	23-Oct-20	0.005	0.005	0.005	0.005	0.005	0.005	0.005
6	27-Apr-21	0.005		0.005	0.005	0.005	0.005	0.005
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.00	0.00	0.00	0.00	0.37	0.00	0.00
Mann-Kendall Statistic (S):		0	0	0	0	0	0	0
Confidence Factor:		40.8%	37.5%	39.3%	39.3%	40.8%	40.8%	40.8%
Concentration Trend:		Stable	Stable	Stable	Stable	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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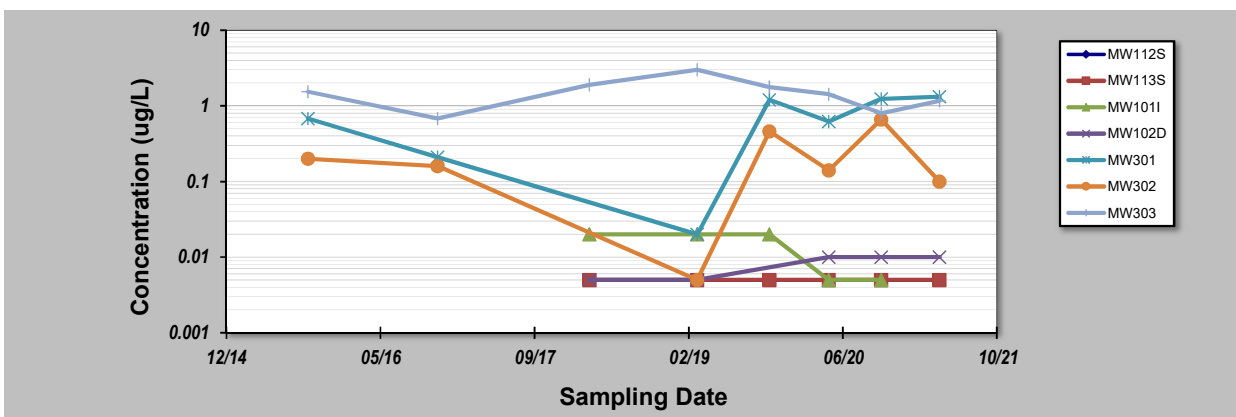
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Former Fuel Farm	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	MW112S	MW113S	MW101I	MW102D	MW301	MW302	MW303
		PFOA CONCENTRATION (ug/L)						
1	18-Sep-15					0.68	0.2	1.54
2	11-Nov-16					0.21	0.16	0.68
3	19-Mar-18	0.005	0.005	0.02	0.005			1.9
4	4-Mar-19	0.005	0.005	0.02	0.005	0.02	0.005	3
5	24-Oct-19	0.005	0.005	0.02		1.2	0.46	1.78
6	4-May-20	0.005	0.005	0.005	0.01	0.62	0.14	1.43
7	21-Oct-20	0.005	0.005	0.005	0.01	1.24	0.66	0.8
8	28-Apr-21	0.005	0.005		0.01	1.32	0.1	1.16
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.00	0.00	0.59	0.34	0.69	0.93	0.48
Mann-Kendall Statistic (S):		0	0	-6	6	11	-1	-6
Confidence Factor:		39.3%	39.3%	88.3%	88.3%	93.2%	50.0%	72.6%
Concentration Trend:		Stable	Stable	Stable	No Trend	Prob. Increasing	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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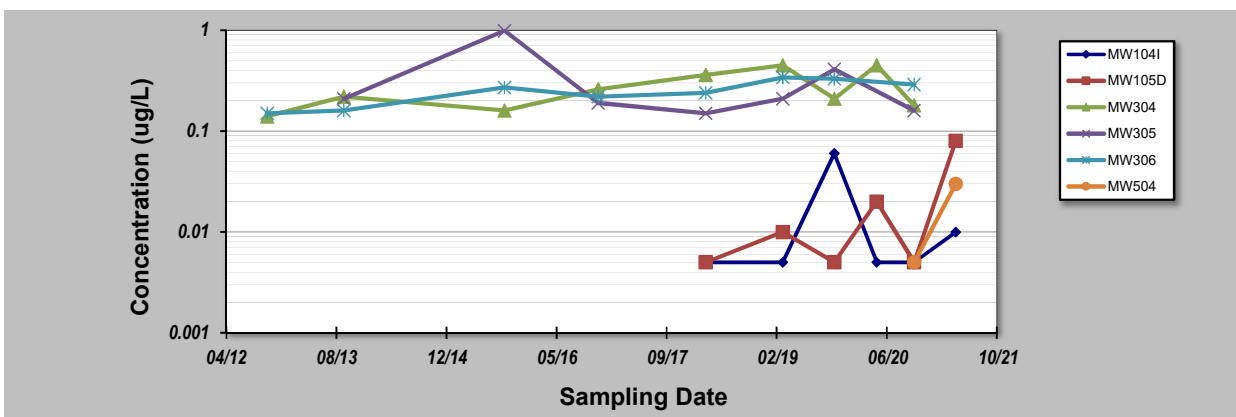
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Fire House & Refuelling Area	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW104I	MW105D	MW304	MW305	MW306	MW504
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Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)					
1	3-Oct-12			0.14		0.15	
2	17-Sep-13			0.22	0.21	0.16	
3	17-Sep-15			0.16	0.99	0.27	
4	15-Nov-16			0.26	0.19	0.22	
5	19-Mar-18	0.005	0.005	0.36	0.15	0.24	
6	4-Mar-19	0.005	0.01	0.45	0.21	0.34	
7	24-Oct-19	0.06	0.005	0.21	0.41	0.33	
8	4-May-20	0.005	0.02	0.45			
9	21-Oct-20	0.005	0.005	0.18	0.16	0.29	0.005
10	28-Apr-21	0.01	0.08				0.03
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		1.48	1.42	0.45	0.91	0.29	1.01
Mann-Kendall Statistic (S):		3	6	13	-4	18	1
Confidence Factor:		64.0%	81.5%	89.0%	66.7%	98.4%	
Concentration Trend:		No Trend	No Trend	No Trend	Stable	Increasing	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
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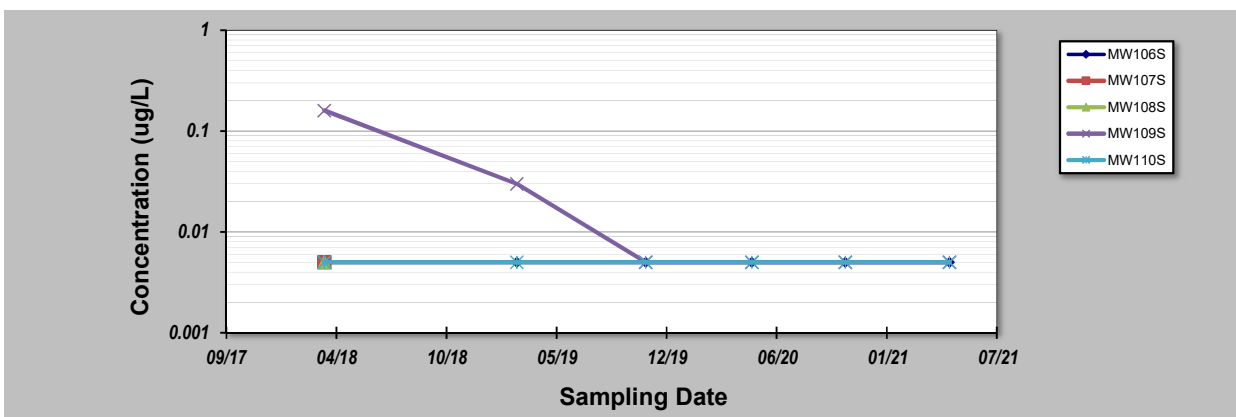
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Landfills	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW106S	MW107S	MW108S	MW109S	MW110S		
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	19-Mar-18	0.005	0.005	0.005	0.16	0.005		
2	4-Mar-19	0.005			0.03	0.005		
3	24-Oct-19	0.005			0.005	0.005		
4	4-May-20	0.005			0.005	0.005		
5	21-Oct-20	0.005			0.005	0.005		
6	28-Apr-21	0.005			0.005	0.005		
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.00			1.77	0.00		
Mann-Kendall Statistic (S):		0			-9	0		
Confidence Factor:		39.3%			93.2%	39.3%		
Concentration Trend:		Stable			Prob. Decreasing	Stable		



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

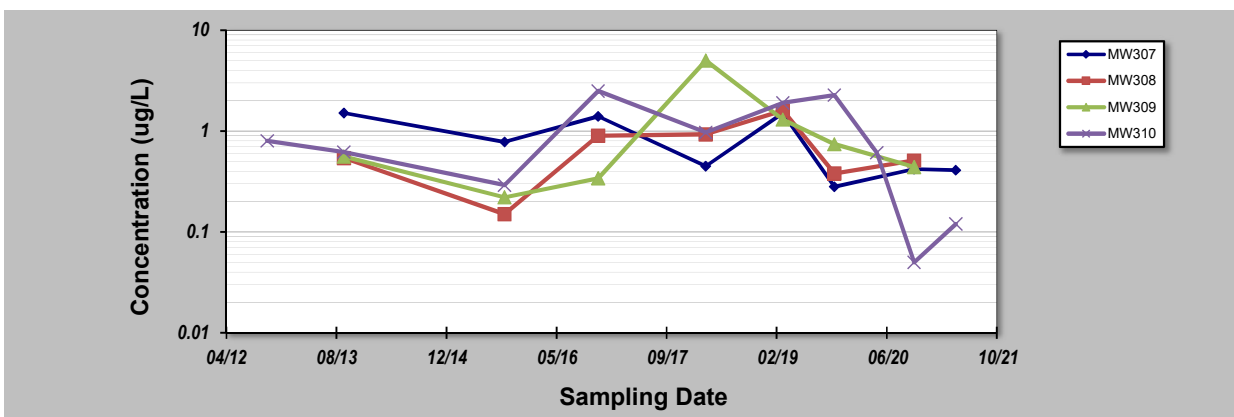
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 1-Nov-21	Job ID: DEF19009
Facility Name: Gingin - Powerhouse	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW307	MW308	MW309	MW310			
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	3-Oct-12				0.8			
2	17-Sep-13	1.51	0.54	0.56	0.62			
3	17-Sep-15	0.78	0.15	0.22	0.29			
4	15-Nov-16	1.4	0.9	0.34	2.5			
5	19-Mar-18	0.45	0.93	5	0.97			
6	4-Mar-19	1.5	1.6	1.3	1.9			
7	24-Oct-19	0.28	0.38	0.74	2.27			
8	4-May-20				0.61			
9	21-Oct-20	0.42	0.51	0.44	0.05			
10	28-Apr-21	0.41			0.12			
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.64	0.67	1.38	0.88			
Mann-Kendall Statistic (S):		-16	3	3	-11			
Confidence Factor:		96.9%	61.4%	61.4%	81.0%			
Concentration Trend:		Decreasing	No Trend	No Trend	Stable			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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