



MFS Port Adelaide Station

Detailed Site Investigation

South Australian Metropolitan Fire Service

07 February 2024

→ The Power of Commitment



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Executive Summary

Background

GHD Pty Ltd (GHD) was engaged by the South Australian (SA) Metropolitan Fire Service (MFS) to undertake a Detailed Site Investigation (DSI) for the Port Adelaide Fire Station, located at Grand Junction Road (Corner Grand Junction Road and Langham Place), Port Adelaide, South Australia, 5015 (the site).

In 2022, GHD undertook a site history review of 17 MFS sites (GHD 2022) and inspections of eight metropolitan sites to support environmental risk profiling using a multi-criteria analysis approach. The work was required to address the potential risks associated with former use of PFAS-containing AFFF. The sites were prioritised to assist with the implementation of appropriate assessment and management measures to address the potential PFAS risks. The Port Adelaide Fire Station was identified as high risk due to a history of AFFF use and previously identified soil impacts.

Objectives

The objective of this investigation is to address the SA Environment Protection Authority (EPA) requirement to undertake a DSI in order to assess:

- The nature and extent of PFAS contamination in soils and groundwater, both on-site and off-site,
- The potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued commercial/industrial use,
- The potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant off-site land uses and receiving environments

Scope of work

The following scope of works was undertaken in general accordance with the SAQP (GHD 2023):

- Collection of 11 surface soil samples (0 - 0.1 m bgl) along the western boundary and in the eastern portion of the site,
- Advancement of seven soil bores on-site, with associated soil logging, target depth sampling and PFAS analysis, including the collection of paver samples where concrete coring is required,
- Installation and development of three permanent on-site groundwater monitoring wells,
- Surveying of the newly installed groundwater monitoring wells relative to Australian Height Datum (AHD),
- Disposal of waste soil and groundwater by a licenced contractor,
- Development of a Conceptual Site Model (CSM), comprising an assessment of PFAS source areas, pathways and receptors,
- Preparation of this DSI

Determination of site contamination

Based on the information presented in this DSI report, it is considered that site contamination exists in relation to PFAS impacts identified in soil in the southwest of the site and on the percolating groundwater beneath the site. The highest impacts are observed in the unsealed ground north-west of the historical storage of PFAS.

Conclusions

The following conclusions were drawn based on the findings of the investigation:

- PFAS impacts in soil at the site are likely related to historical firefighting activities, including training and storage of PFAS-containing AFFF
- The highest concentrations of PFAS in soils were reported in BH04 (0.2-0.3 m bgl) within the historical training area and washdown area

- No exceedances on HIL B or Site-specific Health Investigation Level for MFS metropolitan staffed stations (SSHIL) were reported during the investigation. The site in its current condition is considered suitable for ongoing commercial/industrial use due to no HIL B and SSHILs criteria exceedances in samples taken. The potential risks to human health for the current site use are considered low and acceptable
- Eight exceedances of the tier 1 ecological indirect exposure criteria were reported. Exceedances were reported in samples collected within the historical training area, washdown/flushing area and near the historical storage for PFAS, all situated on the southwest portion of the site. The presence of ecological exposure risks requires further assessment to close out potential impacts to both potential on-site and off-site receptors
- PFAS soil impacts have been delineated vertically to a depth of approximately 0.7 m bgl across the site
- Groundwater exceedances of the adopted PFAS Interim Screening Criteria representing exposure scenarios for domestic and recreational groundwater use were reported in the samples taken from monitoring wells MW01 and MW02
- A potential SPR linkage for on-site and off-site groundwater is plausible but requires further investigations to delineate PFAS presence in groundwater down-hydraulic gradient from the site
- The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not yet been delineated but given the proximity of the site to the Port Adelaide River and relative shallow groundwater depth, the interaction of groundwater with surface waters via direct discharge cannot be discounted

Recommendations

To mitigate the potential ecological and human health exposure risks (i.e., those with confirmed or possible complete SPR linkages) identified in the DSI, the following recommendations are made:

- Further intrusive assessment works to delineate the nature and spatial extent of the contamination off-site to the north-west (down-hydraulic gradient)
- Installation of off-site groundwater monitoring wells (one up-hydraulic gradient and three down-hydraulic gradient, progressively further away from site) to assess the lateral extent of groundwater impacts and potential marine and terrestrial ecosystem exposure risks via the groundwater pathway
- Conduct a groundwater-use survey within the vicinity of the site to evaluate the potential exposure risk of possible groundwater use for currently unidentified domestic/recreational registered well purposes

Limitations

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.4 and the assumptions and qualifications contained throughout the report.

Table of Abbreviations

Abbreviation	Full Form
AFAC	Australasian Fire and Emergency Service Authorities Council
AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
CoC	Contaminants of Concern
CSM	Conceptual Site Model
DQIs	Data Quality Indicators
DSI	Detailed Site Investigation
GAR	South Australian <i>Guidelines for the Assessment and Remediation of Site Contamination 2019</i>
GHD	GHD Pty Ltd
HEPA	Heads of Environment Protection Authorities Australia
HDPE	High-Density Polyethylene
HIL	Human Health Investigation Level
LOR	Limit of Reporting
m bgl	Metres Below Ground Level
MFS	South Australian Metropolitan Fire Service
mg/L	Milligrams per Litre
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEMP	PFAS National Environmental Management Plan Version 2.0 - January 2020
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
PFAS	Per- and Poly-Fluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
SA	South Australian
SA EPA	South Australia Environment Protection Authority
SAQP	Sampling and Analysis Quality Plan
SPR	Source-Pathway-Receptor
SSHIL	Site-specific Health Investigation Level
SWL	Standing Water Level
TDS	Total Dissolved Solids
TOC	Top of Casing
WQEPP	South Australian <i>Environmental Protection (Water Quality) Policy 2015</i>
µg/L	Micrograms per litre
µS/cm	Microsiemens per centimetre

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1. Introduction

GHD Pty Ltd (GHD) was engaged by the South Australian (SA) Metropolitan Fire Service (MFS) to undertake a Detailed Site Investigation (DSI) for the Port Adelaide Fire Station, located at Grand Junction Road, Corner Grand Junction Road and Langham Place, Port Adelaide, South Australia 5015 (the site).

The DSI is limited to potential impacts from the use of aqueous film-forming foams (AFFF) containing per- and poly-fluoroalkyl substances (PFAS) to address the action required by the SA Environment Protection Authority (EPA) GENI 62917 (refer to Appendix A). Other potential contaminating activities and related contaminants of concern (CoC) were not included in this assessment.

1.1 Background

The Port Adelaide Fire Station has been in operation since 1989 and is currently staffed by full-time firefighters.

Historically, MFS have used PFAS-containing AFFF at the site during training activities. MFS commenced phasing out the use of firefighting foams containing perfluorooctane sulfonate (PFOS) in 2007 and perfluorooctanoic acid (PFOA) in 2014 after consultation with the Australasian Fire and Emergency Service Authorities Council (AFAC) and the SA EPA. MFS replaced all firefighting foam in 2016 to ensure that only products designated fluorine-free were in use. During 2017/2018, MFS also removed all fire extinguishers containing PFAS from their sites.

In 2022, GHD undertook a site history review of 17 MFS sites (GHD 2022), and inspections of eight metropolitan sites to support environmental risk profiling using a multi-criteria analysis approach. The work was required to address the potential risks associated with former use of PFAS-containing AFFF. The sites were prioritised to assist with the implementation of appropriate assessment and management measures to address the potential PFAS risks. The GHD 2022 Report was provided to the SA EPA, who subsequently issued a letter dated 1 February 2023 (EPA GENI 62917) with the requirement of “a plan of proposed works and associated timelines to address the highest risk sites” (refer Appendix A). The Port Adelaide Fire Station was identified as one of the eight high priority sites.

GHD have completed a Preliminary Site Investigation (PSI) (GHD 2023a) and Sampling Analysis and Quality Plan (SAQP) (GHD 2023b) for the site. This DSI was prepared to address the data gaps identified in the PSI and the scope of works was undertaken in accordance with the SAQP.

1.2 Objectives

The objective is to respond to the SA EPA requirement to undertake DSI to assess:

- The nature and extent of PFAS contamination in soils and groundwater, both on- and off-site
- The potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued commercial/industrial use
- The potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant off-site land uses and receiving environments

1.3 Scope of works

The following scope of works was undertaken in general accordance with the SAQP (GHD 2023b):

- Collection of 11 surface soil samples (0 - 0.1 m bgl) along the western boundary and in the eastern portion of the site,
- Advancement of seven soil bores on-site, with associated soil logging, target depth sampling and PFAS analysis, including the collection of paver samples where concrete coring is required,
- Installation and development of three permanent on-site groundwater monitoring wells,
- Surveying of the newly installed groundwater monitoring wells relative to Australian Height Datum (AHD),
- Disposal of waste soil and groundwater by a licenced contractor,

- Development of a Conceptual Site Model (CSM), comprising an assessment of PFAS source areas, pathways and receptors,
- Preparation of this DSI

1.4 Limitations

This report: has been prepared by GHD for South Australian Metropolitan Fire Service and may only be used and relied on by South Australian Metropolitan Fire Service for the purpose agreed between GHD and South Australian Metropolitan Fire Service as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than South Australian Metropolitan Fire Service arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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

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

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

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

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

Accessibility of documents

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary

2. Site information

2.1 Site identification

A summary of general site information is provided in Table 2.1. A site location map can be found in Figure 1.

Table 2.1 Summary of General Site Identification Information

Item	Detail
Site Address:	Corner Grand Junction Road and Langham Place, Port Adelaide, SA 5015
Certificate of Title:	CT 5450/700
Legal Description:	Allotment 21, Deposited Plan 20135 in the Area Named Port Adelaide, Hundreds of Port Adelaide and Yatala
Local Government Authority:	City of Port Adelaide Enfield
Current Zoning:	Employment
Property Owner:	South Australian Metropolitan Fire Service
Current Site Use:	Operational Fire Station
Area:	4,349 m ²
Site Elevation:	3 m AHD

2.2 Site description

2.2.1 Site inspection and description

The site is located on the corner of Grand Junction Road and Langham Place. Vehicle access to the property is through one of the two entrances located on Grand Junction Road and Langham Place.

A site inspection was conducted by GHD on 20 July 2022 to identify site features and historical use of PFAS at the site. At the time of inspection, infrastructure consisted of one main building with the engine bay in the northern half of the property, a galvanised iron storage shed in the southwest corner and a rear yard sealed with pavers in the southern portion. A 16,000 L diesel UST and bowser were located near the southeast portion of the property. The majority of the area inside the fence was sealed with only narrow strips of unsealed ground in the form of grass and/or vegetation along the southern and western boundaries and a garden bed in the north-east corner.

Site photographs from the site inspection are presented in Appendix B.

2.2.2 Historical use and storage of PFAS

A questionnaire regarding the historical use of AFFF at the site was circulated to MFS staff. Three Surveys were completed between 20 June 2022 and 4 July 2022 by MFS Staff as part of the multi-criteria analysis. The station officers who had been working at the site for a number of years provided relevant historical anecdotal information in an interview during the site inspection on 20 June 2022. Copies of the completed surveys can be found in Appendix C and a summary is provided below:

- Training exercises involving the use of AFFF were undertaken on an annual basis on-site. During this time, the training ground was unsealed. Approximately 100 L of AFFF was used in each training exercise,
- No wastewater recycling system was in place following training events. Wastewater discharged into drains on-site,
- Stormwater is not harvested for use within the site,
- No groundwater wells/bores exist on-site

According to anecdotal evidence, there was at least one historical incident at Port Adelaide Station where PFAS-containing AFFF was accidentally used instead of high expansion foam so that up to 150 L of AFFF concentrate was released.

AFFF was historically stored at the site in approximately 24 blue plastic drums (200 L), since its opening in 1981. The last training event involving the use of AFFF was held in the mid-1990s. AFFF was historically stored on-site on a skid pod, on the southern boundary of the station car park on a 100 mm raised cement slab. AFFF was transferred from storage containers to the fire trucks/fire-fighting appliances via equipment such as a large foam canon and inductor lines stored in a trailer. The washdown area for fire trucks, equipment or AFFF containers was identified to be the rear yard. It is noted that washing of appliances and equipment are not considered to be a risk of releasing AFFF. However, flushing of the AFFF system on the appliance and any equipment would likely have resulted in the release of AFFF.

2.3 Surrounding land use

Land use surrounding the site is summarised in Table 2.2.

Table 2.2 Land Uses and Zoning

Orientation	Description of Land Use	Zoning (Municipal Council)
North	Grand Junction Road, a plumbing supply store (Reece Plumbing), the Port Adelaide Athletics club and open sporting field immediately north of site. Further north from the sporting field are residential areas and The Alan Iverson Reserve. Beyond the Alan Iverson Reserve is Baynes Place, consisting of the Portland Football Club and associated buildings. A railway line and a shopping complex consisting of various commercial businesses (Kmart, Coles, KFC, Port Adelaide Plaza Shopping Centre, tyre shop, etc.) is further north.	Recreation, Urban Activity Centre, Port Adelaide Centre
East	Langham Place immediately east of site followed by residential areas and various warehouse services. A service station (Liberty Oil) and glass services is situated further east.	Employment
South	An excavating contractor (Pay Dirt Excavations) is located immediately south of site, along Langham Place. Further south are residential areas and a wholesale event supplier (In Any Event Wholesale Event Supplies). Various commercial businesses (used car dealer, Australia Post, a hose supplier) are located to the southwest.	Employment, Housing Diversity Neighbourhood
West	Endeavour Drive immediately west of site followed by a service station (Mobil Port Adelaide). Beyond the service station is a dam, Old Port Road, a BMX track and West Lakes Beach further west.	Strategic Employment

The SA EPA site contamination index lists an audit notification and potentially contaminating activities (metal processing, metallurgical works and metal coating) for a site in 55 College Street, 240 m north-east of the site. Historically, PFAS were often used as mist suppressants in metal processing (electroplating). However, assuming groundwater flow is west/north-west towards the Port Adelaide River, 55 College Street is likely located down-hydraulic gradient of the Port Adelaide Fire Station and therefore not likely relevant as a potential off-site PFAS source.

3. Previous investigations

Previous investigations at the Port Adelaide Fire Station have been carried out by GHD in 2019, 2022 and 2023. Documentation of these investigations can be found in the following reports:

- GHD (2019) *MFS State-wide Appliance and Station Sampling*, Report for South Australian Metropolitan Fire Service, May 2019
- GHD (2022) *MFS 17 Fire Stations PFAS Risk Profiling*, Report for South Australian Metropolitan Fire Service, October 2022
- GHD (2023) *MFS Port Adelaide Station, Preliminary Site Investigation*, Report for South Australian Metropolitan Fire Service, July 2023
- GHD (2023) *MFS Port Adelaide Station, Sampling Analysis & Quality Plan (SAQP)*, Report for South Australian Metropolitan Fire Service, September 2023

3.1 GHD (2019) MFS State-wide appliance and station sampling

GHD (2019) reported that the MFS Port Adelaide Station was included in preliminary environmental investigations carried out at 35 fire stations across South Australia to assess for the presence of PFAS concentrations that may remain in firefighting appliances, accessible soils and any biota (fruit, vegetables, herbs and poultry) if present at the time of the investigation.

During the GHD (2019) investigation, the following soil samples were collected and tested for PFAS:

- Two soil samples collected from the south-west corner of the boundary directly in front of the chicken coop, where AFFF has been historically sprayed. Both samples exceeded the PFAS NEMP Ecological indirect exposure criteria for PFOS. No exceedances of the other criteria were observed

Sampling locations from the 2019 sampling event can be found in Figure 2.

It is noted that the 2018 PFAS NEMP guidelines were used in this report, which were superseded by the 2020 PFAS NEMP 2.0. However, this has no practical impact on the purposes of this report as the guideline values for soil at commercial/industrial properties are the same in both versions of the PFAS NEMP. In the 2020 PFAS NEMP 2.0, environmental guideline values that refer to the sum of PFOS and perfluorohexane sulfonate (PFHxS) now explicitly apply not only to the sum of the two but also to PFOS only and to PFHxS only, which was only inferred in the 2018 PFAS NEMP 1.0. It should be noted that there is a new version of the PFAS NEMP currently in review (3.0).

3.2 GHD (2022) MFS 17 Fire Stations PFAS Risk Profiling

The MFS Port Adelaide Station was part of a 2022 desktop risk assessment and multi-criteria analysis carried out at 17 MFS fire stations across SA to support appropriate risk management approaches associated with potential or identified PFAS contamination. The 17 sites required for prioritisation, including Port Adelaide, were identified by the SA EPA in the letter GENI 62485 dated 21 October 2021 and is included in Appendix A.

The methodology and findings of the PFAS risk profiling for the 17 MFS fire stations reported PFAS impacted in soil. The desktop review focused on identifying historical activities that may represent a source of PFAS contamination and potentially sensitive human or ecological receptors in the vicinity of the sites as well as understanding potential source-pathway-receptor linkages that may be present.

The report provided a summary of the sites' prioritisation for further assessment based on their potential to cause harm to the environment and/or human health.

The MFS Port Adelaide Station was classified as a high priority for further investigation of PFAS contamination for the following reasons:

- Estimated historical on-site use of AFFF concentrate,
- Depth to groundwater and risk of AFFF infiltration to groundwater,
- Distance to closest surface water body,
- Residential land use adjacent the site (in development).

3.3 GHD (2023a) MFS Port Adelaide Station Preliminary Site Investigation

A PSI was undertaken to review historical site activities which may have contributed to PFAS contamination at the site and potentially off-site.

The potential risks to human health and the environment outlined in the Preliminary CSM were as follows:

- Exposure of site users, visitors, maintenance and construction workers to PFAS via direct dermal contact with contaminated soil, incidental ingestion of contaminated soil or inhalation of contaminated soil/dust from disturbed soils,
- Exposure of site users, visitors, maintenance and construction workers to PFAS via direct dermal contact with PFAS impacted concrete/bitumen surfaces or inhalation of contaminated dust from such surfaces,
- Leaching of PFAS from contaminated soils or concrete/paver surfaces followed by migration through porous media into groundwater,
- Consumption of contaminated groundwater extracted off-site for domestic/drinking purposes,
- Consumption of edible vegetation grown off-site where plants were irrigated with contaminated groundwater or where plant roots accessed shallow contaminated groundwater. It should be noted that no edible vegetation is present at the site,
- Incidental ingestion of contaminated groundwater extracted off-site for recreational purposes such as filling of swimming pools,
- Fresh water aquatic life found in surface water receptors such as the Port Adelaide River

The outcomes of these works are incorporated in the applicable sections of this report.

3.4 GHD (2023b) MFS Port Adelaide Station Sampling Analysis and Quality Plan

Following finalisation of the PSI, an SAQP was prepared to undertake intrusive investigations for the delineation of the lateral and vertical extent of PFAS contamination on- and off-site.

The purpose of the SAQP was to present the scope of work, methodologies, and sampling rationale to be utilised during the further intrusive works for this DSI to meet the investigation objectives.

Based upon the results of this PSI and the Preliminary CSM, the following data gaps were identified:

- The spatial extent of PFAS contamination in soils across the site had not been delineated,
- The presence of PFAS contamination in groundwater had not been determined,
- The presence of PFAS contamination in off-site surface water bodies had not been determined,
- The extent of PFAS contamination in on-site concrete and paved surfaces and the associated PFAS flux from these materials had not been assessed,
- The extent of groundwater use for domestic (i.e., potable), irrigation or recreational purposes down-gradient of the site was unknown,
- The potential for PFAS to leach from contaminated on-site soil into the groundwater had not been assessed

4. Environmental setting

4.1 Topography

The topography of the site and surrounding land is relatively flat and forms part of the Adelaide Plains, between the St Vincent Gulf to the west and the Mount Lofty Ranges to the east. The site sits at an elevation of approximately 3 m AHD. The surrounding land gently slopes west towards the Port Adelaide River.

4.2 Site drainage

The topography of the site is relatively flat with the majority of the fenced in site area sealed with hardstand. The north-eastern portion of the site is unsealed grass. There are two stormwater pits located in the rear yard, one of which is in the washdown area. Additionally, two linear stormwater drains are located at the Grand Junction Road and Langham Place entrance driveways.

Stormwater in the area appears to be stored in a stormwater retention basin 110 m west of the site, which subsequently discharges to Port Adelaide River. No wastewater recycling system was in place following training events. Wastewater discharged into drains on-site. Stormwater was not known to be harvested at the site.

4.3 Surface water

The nearest natural surface water bodies from the site were identified as follows:

- A stormwater retention basin (Wellington Street, Pump Station) is located approximately 110 m west of the site. This is a council-owned and operated stormwater retention basin /pumping station used to manage drainage of the surrounding stormwater system. It is understood that water from this pumping station is discharged into the northern end of West Lakes which subsequently drains to the Port Adelaide River through a one-way spill way.
- Port Creek, which turns into the Port Adelaide River, is located approximately 530 m west of the site which flows north-east and discharges into the St Vincent Gulf, approximately 2.77 km west of the site,
- The St Vincent Gulf is located approximately 2.77 km west of the site.

4.4 Geology

The PSI (GHD 2023a) indicated that the site is characterised by the Saint Kilda Formation, consisting of coastal marine sediment characterised by calcareous, fossiliferous sand and mud of intertidal sand flats, beaches and tidal marshes; organic, gypseous clay of supratidal flats.

Most common soil classification orders were identified to be predominantly Rudosols, which are characterised by coastal dunes and plains with some swamps, dunes of calcareous sands, siliceous sands, plains of various saline soils (unclassified) and lesser areas of brown calcareous earths.

The site lies within a region of low probability of potential acid sulphate soil (PASS) occurrence.

4.5 Hydrogeology

Regional groundwater flow is inferred to be westerly/north-westerly towards the Port Adelaide River.

The Port Adelaide Fire Station lies within the Hydrogeological Zone 3 (Gerges 2006). This zone contains five to six Quaternary aquifers and three to four Tertiary aquifers. The first quaternary aquifer (Q1), which is the subject of groundwater investigations in this report, has an average thickness of 2 m at an average depth of 3 m bgl to 10 m bgl.

A search of the South Australian Resources Information Gateway (SARIG) database reported shallow groundwater in the vicinity of the site with standing water levels (SWL) of 2-5 m bgl, producing yields in the range of 0.5-2.5 L/second. Groundwater salinity ranged from 7,000-14,000 mg/L total dissolved solids (TDS), indicating

brackish to saline water. Note, SARIG is a coarse resolution database which provides average data over large areas.

4.6 Local groundwater users (WaterConnect Database)

A search of the South Australian WaterConnect database (DEW 2023) for registered groundwater wells, and associated data, located within a 2.0 km radius of the site was completed on 19 September 2023. The results are summarised as follows:

- 795 wells were registered within a 2.0 km radius,
- Of these registered wells, 94 were listed as backfilled, 62 as operational, 62 as abandoned, 21 as dry, one as decommissioned, one as rehabilitated, 53 as having an unknown status and no status was listed for 501 wells,
- Of the 62 registered operational wells, 45 were listed as domestic, 10 as irrigation, four as Managed Aquifer Recharge, one as recreational, one as industrial and one as irrigation/Managed Aquifer Recharge,
- Of the 554 wells with unknown or no registered status, 171 were for investigation purposes, 89 for monitoring, 53 for domestic, 43 for environmental, 13 for observation, four for drainage, four for irrigation, two for industrial and 175 had no purpose listed
- TDS data were available for 219 wells and ranged between 138 mg/L and 54,661 mg/L, indicating fresh to hyper-saline water. High TDS values were associated with groundwater wells west of the Port Adelaide River, closer to the St Vincent Gulf. The five closest wells with TDS data less than 30 years old and located east of the Port Adelaide River, ranged between 598 mg/L and 2,154 mg/L. These values were deemed to better represent groundwater at the site

5. Assessment criteria

The CoCs in this investigation were limited to PFAS. As such, assessment criteria from HEPA (2020) PFAS National Environmental Management Plan (Version 2.0) and Heads of Environment Protection Authorities Australia and New Zealand, January 2020 (PFAS NEMP) have been used.

5.1 Soil

In accordance with the PFAS NEMP 2020, the PFAS assessment criteria listed in Table 5.1 have been adopted for the assessment of soil samples.

Table 5.1 Adopted PFAS Assessment Criteria – Soil

Exposure Scenario	PFHxS ¹	PFOS ²	Sum of PFOS and PFHxS	PFOA ³	Principal Reference Document
Human Health Investigation Levels (HIL)					
HIL-B residential with limited soil contact	2 mg/kg	2 mg/kg	2 mg/kg	20 mg/kg	PFAS NEMP (HEPA 2020)
Site-specific HILs ⁴ for the screening of PFAS contaminated soils at MFS sites (Metropolitan, Staffed)	-	-	14 mg/kg	50 mg/kg	Derivation of site-specific health investigation levels for urban and regional fire stations (GHD, June 2023)
Ecological Screening Levels					
Ecological indirect exposure	-	0.14 mg/kg	-	-	PFAS NEMP (HEPA 2020)
Ecological direct exposure	-	1 mg/kg	-	10 mg/kg	PFAS NEMP (HEPA 2020)

Notes:

¹ PFHxS – perfluorohexane sulfonate

² PFOS – perfluorooctane sulfonate

³ PFOA – perfluorooctanoic acid

⁴ Discussed further in section 5.1.1

Typical site usage patterns at MFS fire stations most closely align with the exposure assumptions that underpin HIL D (commercial/industrial) values. The following inconsistencies are however noted:

- The PSIs undertaken at MFS sites across South Australia identified that some fire stations have a higher proportion of unsealed ground (up to approximately 75% of the total site area) than has been assumed in the derivation of the HIL D values (up to approximately 20% of the total site area). As a result of this, there may be greater opportunities for direct access to soil at MFS fire stations, including the ingestion of soil and soil-derived dust

- The shifts worked by MFS firefighters do not align with the assumption of a standard working week that underpins the HIL D values. Given these factors, Site-specific Health Investigation Levels (SSHILs) have been derived using exposure assumptions that reflect the typical usage pattern of the MFS fire stations, to allow for tailored assessment of the potential exposure risks that may be associated with the presence of PFAS in shallow soils (GHD 2023c). Further discussion regarding the development of the SSHILs is provided in Section 5.1.1.

GHD has made reference to HIL B criteria presented within the PFAS NEMP (2020) to enable assessment of contamination exposure risks with respect to its current land use.

GHD has referred to both the ecological direct exposure and indirect exposure scenario criteria within the PFAS NEMP (2020) to assess potential ecological exposure risks. These generic criteria apply to all land use scenarios. Further discussion regarding these criteria is provided in Section 5.1.2. The PFAS NEMP (Section 8, 2020) provides nationally agreed guideline values that are to be used to inform site investigations. The guidelines have been derived based on existing nationally agreed long standing Australian processes.

5.1.1 Site specific human health soil guideline values

GHD letter report *Derivation of site-specific Health Investigation Levels (HILs) for urban and regional fire stations* (GHD, July 2023) outlines site-specific HILs (SSHILs) for the two types of MFS fire stations:

- Urban/metropolitan (also referred to as “staffed”)
- Regional (also referred to as “retained”)

The methodology and associated exposure assessment processes are outlined in Appendix E. The SSHILs will be used in place of the generic HIL D (commercial/industrial) guidelines from the PFAS NEMP 2.0 for the purpose of preliminary screening of potential human health exposure risks for MFS sites.

Additionally, GHD understands that MFS, in consultation with the United Fire Fighters Union of South Australia, have agreed to also adopt a more stringent health investigation level of HIL B (residential with limited soil access) as a “trigger” for further engagement. This has been included at the direction of MFS and is for comparison purposes only.

There are no criteria specific to the assessment of concrete and bitumen regarding potential human health or ecological risk. Sampling of these media has been conducted to assess their potential to act as an ongoing source of PFAS impact to the environment via leaching.

5.1.2 Ecological soil guideline values

The PFAS NEMP provides the following guidance regarding ecological risk for soils:

- “For intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg may be appropriate
- “The indirect exposure value may be over-protective if the area of exposed soil is too small to have any material impact on food chain transfer to secondary consumers such as invertivores and carnivores. In this situation, considering site-specific characteristics may justify the use of a higher value (up to 0.14 mg/kg) as the trigger for a detailed site-specific investigation of risk”

The PFAS NEMP does not provide a rationale for the selection of the 0.14 mg/kg, however GHD notes that this value was sourced from the same document as the other ecological criteria, namely Environment and Climate Change Canada (ECCC 2017) *Federal Environmental Quality Guidelines Perfluorooctane Sulfonate (PFOS)*. This document provides 0.14 mg/kg as the soil guidelines for PFOS in two circumstances:

- Soil Quality Guideline to Protect Freshwater Life under all land uses
- Soil Quality Guideline for Off-site migration under commercial/industrial land uses

The soil quality guideline to protect freshwater aquatic life is the concentration in soil that is expected to protect against potential impacts on freshwater aquatic life from PFOS originating in soil that may enter the groundwater and subsequently discharge to a surface water body.

The calculation of this value was made on the basis of the Canadian aquatic screening criteria for PFOS in surface water (6.8 ug/L) and a reverse fate and transport modelling process that assumes a minimum of 10 m lateral separation between the source and the surface water body and incorporates default parameters describing partitioning from soil to leachate, leaching to groundwater, mixing with groundwater and plume migration. The protection of aquatic life from soil impacts via migration in groundwater will be included in a groundwater assessment at the site. The closest aquatic receptor is the Barker Inlet Wetlands approximately 1.7 km from the site, as well as a network of open stormwater drainage channels bounding the site.

The soil quality guideline for off-site migration under commercial/industrial land uses considers the potential that wind and water erosion of soil can move PFOS contaminated soil from one site to another. The endpoint used to calculate this guideline is the soil quality guideline protective of ecological receptors in residential and agricultural land use settings (0.01 mg/kg - the ecological indirect criteria). A model was then used to predict the movement of soil, including the Universal Soil Loss Equation and the Wind Erosion Equation. CCME (2017) specifically states that this approach is imprecise and that the derived values should be used as a check mechanism only, with professional judgement used to assess whether this is likely to be a migration pathway of concern for an individual site. Given the predominantly commercial land use surrounding the site, it is unlikely than any soil migrating from the site via erosion would be deposited in an area of significant ecological value.

Although the CCME (2017) guidelines have been superseded, the more recent guidelines (Specific Criteria Document for the Development of the Canadian Soil and Groundwater Quality Guidelines for the Protection of Environmental and Human Health - Perfluorooctane Sulfonate) use a similar approach and derive similar values. The reference to the CCME (2017) for this document is to maintain consistency with the PFAS NEMP 2.0 and the original reference material within that document.

5.2 Groundwater

5.2.1 Environmental values of groundwater

The South Australian Environment Protection (Water Quality) Policy 2015 (and amendments) (SA EPA 2015) (EPP) details the regulatory requirements for the protection of all water bodies (surface and groundwater) under the Environment Protection Act 1993. The Policy outlines the applicable environmental values (EVs) for a range of waters, including public stormwater and irrigation drains as well as providing definitions of harm, types of pollutants and the provisions that a person must comply with in taking all reasonable and practicable measures to prevent or minimise harm. Table 5.2 outlines the EVs for various waters as described in Schedule 1 of the EPP.

Table 5.2 *Environmental Values of Particular Waters (Extract from Schedule 1, Table 3 WQEPP)*

Waters	Aquatic ecosystems	Recreation and aesthetics	Drinking water for human consumption	Irrigation and general use	Livestock watering	Aquaculture and aquatic food production
Marine waters	X					X
Surface waters	X		X	X	X	X
Surface waters (Protection areas ¹)	X	X	X	X	X	X
Public stormwater systems	X	X				
Groundwaters						
TDS < 1,200 mg/L			X	X	X	X
TDS between 1,200 - 3,000 mg/L				X	X	X
TDS between 3,000 - 13,000 mg/L					X	X

While not identified specifically in the EPP, contaminated site assessments typically consider the potential for abstraction of groundwater for recreational use and migration to aquatic ecosystems. These EVs have been included in the assessment process.

To assess the contamination status of groundwater at a site, the GAR (SA EPA 2019a) provides a four-step process to determine the environmental values of groundwater and if actual or potential harm to groundwater that is not trivial has occurred. The four-step process provided in the GAR is described in Table 5.3.

Table 5.3 Four-step Process for Determining Environmental Values of Groundwater

Process	Assessment
Step 1: Apply Table 3 of Schedule 1 of the 2015 Water Quality Environment Protection Policy (WQEPP, Gov SA 2015) based on TDS ranges	A search of the Waterconnect database on 19 September 2023 listed 795 registered bores located within a 2.0 km radius of the site. The TDS data (<30 years old) for the five closest wells to the site ranged between 598 mg/L and 2,154 mg/L, indicating fresh (<1,000 mg/L) to slightly saline (1,000-3,000 mg/L) water.
Step 2: Assess and identify surface water bodies within a 2 km buffer of the site	Surface water receptors identified within 2.0 km of the site include a stormwater retention basin located approximately 110 m west of the site and Port Adelaide River located approximately 530 m west of the site. The Port Adelaide River meanders in a north-west direction toward Outer Harbour where it eventually discharges into the St Vincent Gulf.
Step 3: Review registered groundwater users in the WaterConnect database	A review of the Water Connect database on 19 September 2023 identified a total of 795 registered bores within a 2.0 km radius of the site. The identified uses of the bores with operational or unknown status were domestic (45), domestic (58), industrial (1), irrigation (11), irrigation/Managed Aquifer Recharge/monitoring (1), Managed Aquifer Recharge (4), recreational (1) and unlisted (52).
Step 4: Application of the SA EPA recognised criteria for the most sensitive environmental value	The most sensitive environmental values to be applied to the site are the PFAS NEMP 2020 Drinking Water for human health.

Due to the site's proximity to the Harbour of Port Adelaide and St Vincent Gulf, it was deemed to have aquatic ecosystem, recreation, and aesthetic values. The adopted groundwater screening/investigation levels, which are considered to protect potentially complete source, pathway, receptor linkages, are summarised in Table 5.4.

Table 5.4 Adopted PFAS Interim Screening Criteria for Groundwater

Exposure Scenario	PFOS ¹	PFHxS ²	Sum of PFOS and PFHxS	PFOA ³	Source
Human Health – Recreational Water (domestic)	0.7 µg/L	0.7 µg/L	0.7 µg/L	5.6 µg/L	NHMRC 2008 ⁵ ADWG (NHMRC 2011) ⁴
Human Health – Drinking Water ⁵	0.07 µg/L	0.07 µg/L	0.07 µg/L	0.56 µg/L	PFAS NEMP (HEPA 2020)
Health Recreational Water	2.0 µg/L	2.0 µg/L	2.0 µg/L	10 µg/L	
Marine waters 95% Species Protection – Slightly to moderately modified ecosystems	0.13 µg/L	-	-	220 µg/L	
Marine waters 99% Species Protection – High conservation value ecosystems	0.00023 µg/L	-	-	19 µg/L	

Notes:

¹ PFOS – perfluorooctane sulfonate

² PFHxS – perfluorohexane sulfonate

³ PFOA – perfluorooctanoic acid

⁴ The NHMRC 2008 Guidelines for Managing Risks in Recreational Water recommend health guideline values for recreational water that correspond to 10 times the current drinking water guideline value. These guideline values apply in a domestic setting where groundwater is used for recreational purposes such as the filling of swimming pools.

⁵ Australian Drinking Water Guidelines 6, Version 3.7, updated January 2022

6. Soil investigation

6.1 Soil sample locations and rationale

The soil investigation works described in this section were conducted on 18 and 19 October 2023 under the supervision of an experienced GHD environmental professional. A total of seven soil bores (BH01 to BH07) and three groundwater monitoring well bores (MW01 to MW03) were drilled and ten surface soil samples were taken as a part of the intrusive soil investigation (SS01 to SS11 [excluding SS09]). The investigation locations are shown in Figure 3.

A summary of the rationale behind each location is provided in Table 6.1 below.

Table 6.1 Soil Sample Location Rationale

Proposed Soil Sample Location ID	Location Rationale
BH01	East of historic training, washdown and AFFF storage area.
BH02	
BH03	
BH04	Area within historical training and washdown area.
BH05	
BH06	
BH07	Southwest corner of historic training and AFFF storage area.
MW01	East of the 16,000 L Diesel UST.
MW02	Southwest corner of historic training and east of the AFFF storage area.
MW03	North-west portion of the MFS building, edge of the driveway.
SS01	Southeast corner of the site boundary, near the rear driveway.
SS02	Western boundary of the site adjacent to the historic training, washdown and AFFF storage areas.
SS03	
SS04	
SS05	Southwestern corner of the site, south-west and south of AFFF storage area respectively.
SS06	
SS07	Located on unsealed grass area in the eastern portion of the site to investigate potential impacts from overspray.
SS08	
SS09	
SS10	
SS11	

GHD notes the number of soil sampling locations was in accordance with the NSW Sampling Design Guidelines requirement for the minimum number of sampling locations for a targeted sampling design at a site with an area of 4,349 m².

6.2 Methodology

The methodologies detailed below are in accordance with the following guidelines:

- HEPA (2020) PFAS NEMP (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (PFAS NEMP)
- National Environment Protection (Assessment of Site Contamination) Measure (1999) as amended in 2013 (ASC NEPM)
- WA DER (2017) Interim Guideline of Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), Version 2.1, Contaminated Sites Guidelines, Department of Environment Regulation, Western Australia, Perth, January 2017

The soil investigation methodology was as follows:

- Prior to any intrusive works being undertaken, a review of Before You Dig plans was conducted and all investigation locations were also cleared for underground service by an accredited service locator to ensure safe drilling conditions
- A total of 10 bores (BH01 to BH07 and MW01 to MW03) were drilled as part of the soil investigation. Locations positioned within hardstand areas required concrete/paver cutting prior to drilling
- All soil bores were advanced via drill rig utilising push tube drilling techniques. High density polyethylene (HDPE) core liners were used to retrieve soil cores to minimise the risk of PFAS cross-contamination.
- Surface soil samples were taken as grab samples using a hand trowel which was decontaminated between each sample location
- Soils recovered from each soil bore were logged by an experienced GHD environmental professional, and representative soil samples were collected at regular depth intervals and at each new soil horizon for potential laboratory analyses
- A fresh pair of disposable gloves were worn by the sampler when collecting each individual sample and were placed in laboratory-supplied sampling jars suitable for PFAS analysis. Soil samples from soil bores were collected immediately following drilling. In general, soil samples were taken at near surface (0.1 m bgl), at 0.5 m bgl and every 0.5 m thereafter
- Quality assurance and quality control (QA/QC) samples including intra-laboratory duplicate samples, inter-laboratory duplicate (split) samples, and rinsate blanks were collected as part of the soil sampling program
- Logging of the soil bores was undertaken by an environmental scientist to assess the underlying geology and contaminant indicators in accordance with AS 1726:2017
- Soil samples were stored in an ice filled cool box and transported to a National Association of Testing Authorities (NATA) accredited laboratory under chain of custody documentation

6.3 Soil analytical program

All soil samples were submitted to a NATA accredited laboratory for analysis. In general, two to three samples from each borehole were analysed, with each sample analysed for PFAS compounds.

6.4 Soil sampling results

6.4.1 Subsurface conditions

Fill material was encountered across all the soil and borehole locations. Generally, the fill material was comprised of sandy material which altered sequentially into gravelly sand or silty sand at succeeding depths. The top fill horizon was characterised by loose and poorly graded thin layer of fine to coarse grained sand with distinguishing orange-brown colour.

The underlying fill horizon was a tan coloured fine to medium sandy material with gravel size clastics. This loose and poorly graded horizon was distinguishable with its minor sub-angular fine to medium gravel inclusions. The gravelly sand was primarily within the depths between 0.12 - 0.4 m bgl.

A thin horizon of silty sand underlying the fill material horizons was encountered in most of the bores, likely indicating the contact between fill material and natural soil. In BH03, a waste horizon comprising of concrete debris underlay this horizon. In BH05 and MW01, this horizon was substituted by fine sand.

Natural soil was encountered at 0.7 m bgl and below. Generally, the natural soil was comprised of poorly graded, low to medium plasticity, fine to medium grained sandy clay materials. Mottling and shell fragment embeds were distinctive at some portion. Coloration of the material progressed from hues of dark brown to pale grey.

A summary of materials encountered at the site is provided in Table 6.2. Detailed borelogs can be found in Appendix D.

Table 6.2 Summary of Material Encountered

Lithology	Depths observed (m bgl)	Description
Fill	0.08 - 0.12	SAND fine to coarse, poorly graded, orange- brown
	0.12 - 0.4	Gravelly SAND; fine to coarse sand with fine to medium gravels, grey to brown, slightly moist, loose
	0.4 - 0.85	Silty SAND fine to medium, poorly graded, dark brown
Natural soils	0.85 - 1.6	Sandy CLAY low to medium plasticity, dark brown, with shells, fine to medium, poorly graded sand
	1.6 - 3.0	Sandy CLAY low to medium plasticity, dark grey, with shells, fine to medium, poorly graded sand
	3.0 - 4.0	Sandy CLAY low to medium plasticity, pale grey, fine to medium, poorly graded sand

6.4.2 Analytical results

The exceedances of the adopted assessment criteria protective of human health and the environment are presented in Table 6.3 and Figure 6. PFAS concentrations in all remaining soil samples were reported to be below the adopted assessment criteria or below the laboratory reporting limits.

The laboratory certificates for the soil analytical results, along with chain of custody and sample receipt notifications, are provided in Appendix F. A full set of tabulated analytical results can be found in Appendix G.

Table 6.3 Results Above Adopted PFAS Assessment Criteria

Location	Depth (m bgl)	PFHxS (mg/kg)	PFOS (mg/kg) ¹	PFOA (mg/kg)	Sum of PFHxS and PFOS (mg/kg)
BH03	0.6 - 0.7	0.0051	0.467	0.0004	0.472
BH04	0.2 - 0.3	0.0134	0.518	0.0008	0.531
BH06	0.3 - 0.4	0.0085	0.324	0.0010	0.332
BH07	0.35 - 0.45	0.0223	0.480	0.0030	0.502
MW02	0.08 - 0.18	0.0005	0.180 ²	<0.0002	0.150
SS04	0 - 0.1	0.0141	0.148	0.0021	0.162
SS05	0 - 0.1	0.0111	0.397	0.0049	0.408
SS10	0 - 0.1	0.0197	0.246	0.0013	0.266

Note: 1. Blue denotes an exceedance of the ecological indirect exposure assessment criteria for developed sites

2. Exceedances for MW02 were reported on the duplicate and split samples.

The concentrations of all remaining PFAS analytes in samples assessed were reported either below the laboratory reporting limits or below the adopted ecological and health assessment criteria. All exceedances of the adopted criteria were from the site surface down to a maximum depth of 0.7 m bgl. All soil results at depths greater than 0.7 m bgl were below the adopted criteria.

7. Paver investigation

7.1 Scope of works and rationale

Paver sampling was conducted in conjunction with the soil investigation works on 18 and 19 October 2023. As stated in Section 5.1.1, there are no criteria specific to the assessment of concrete regarding potential human health or ecological risk. Sampling of these media was conducted to assess their potential to act as an ongoing source of PFAS impact to the environment via leaching.

A total of two paver samples were analysed as part of the soil investigation (BH04_PAVER and BH07_PAVER).

7.2 Methodology

The following works were undertaken as part of the paver investigation:

- Paver samples were collected from extracted cores by hand with a pair of clean nitrile gloves,
- Samples were broken into small fragments using a mallet, placed into laboratory-supplied sampling jars suitable for PFAS analysis and transferred to a cooler,
- Samples were delivered to the analytical laboratories under chain of custody documentation protocols,
- Collection of QA/QC samples including intra-laboratory (blind) duplicate samples and inter-laboratory (split) duplicate samples.

7.3 Analytical results

There were no reported exceedances of the adopted assessment criteria for either human health or ecology.

8. Groundwater investigation

8.1 Groundwater well locations and rationale

Three permanent groundwater wells (MW01 to MW03) were installed on-site to target the following site features:

- One up-hydraulic gradient well (MW01) in the southeast corner of the site to infer the upgradient groundwater flow from the former training and washdown area and to enable the calculation of the local groundwater flow direction
- One down-hydraulic gradient well (MW02) in the southwest corner of the site to determine the potential presence of on-site PFAS sources and also to assess the degree of PFAS impacts to groundwater in the vicinity of the former training/washdown area
- One down-hydraulic gradient well (MW03) north-west corner of the site to enable the calculation of the local groundwater flow direction and to assess whether PFAS in groundwater may have migrated off-site
- Survey of the three groundwater monitoring wells relative to Australian Height Datum (AHD)
- All wells were installed in accordance with the Minimum Construction Requirements for Water Bores in Australia (4th Edition, NUDLC 2020)

The location of the monitoring wells is shown in Figure 3.

8.2 Well installation methodology

All groundwater monitoring wells were drilled and installed by WB Drilling Pty Ltd under the supervision of an experienced GHD environmental professional. The drilling method used included hollow flight auger to the base of the borehole. A well permit was obtained from the Government of South Australia's Department of Environment and Water. Copies of well permits are provided in Appendix H.

The well construction methodology is outlined below:

- Each monitoring well was drilled to a depth of approximately 4 m bgl. The water strike was determined through various observations including appearance of water and changes in soil moisture content
- 3 m slotted polyvinyl chloride (PVC) screens were installed from the base of the boreholes with solid PVC casing to the surface. This length was considered adequate to account for seasonal groundwater level variations
- A gravel pack was installed around the screen, extending from the base to 0.5 m bgl
- A bentonite plug was installed above the gravel pack to protect the aquifer from any direct infiltration of surface water into the well screens
- A lockable gatic cover was installed and concreted in place, approximately flush to the surrounding ground surface
- Following installation, the groundwater wells were developed to remove excess silt/entrained sediments and to ensure representative groundwater was flowing into the well. The wells were developed using a decontaminated steel bailer. The bailer was decontaminated between well locations using a phosphate-free detergent and subsequently rinsed with tap water, followed by de-ionised water
- Groundwater wells were surveyed by a licensed surveyor (Linkup Construction Surveys Pty Ltd). The survey results are included in Appendix I

Table 8.1 below presents a summary of the construction details along with survey details (elevation) of the wells. Groundwater well construction logs are presented in Appendix D.

Table 8.1 *Well Construction Details*

Well ID	MW01	MW02	MW03
Date Installed	19/10/2023	19/10/2023	19/10/2023
Bore Depth (m bgl)	4.0	4.0	4.0
Screen & Casing	PVC Class 18	PVC Class 18	PVC Class 18
Screen & Casing Internal Diameter (mm)	50	50	50
Screen Length (m)	3	3	3
Casing Length	4	4	4
Well Depth (m bgl)	4	4	4
Ground Level (m AHD)	1.236	1.219	1.203
Top of Casing (TOC) Level (m AHD)	1.130	1.136	1.137
Filter Pack	Filter gravel (8/16) pack from base of the well to 0.5 m above the screen.	Filter gravel (8/16) pack from base of the well to 0.5 m above the screen.	Filter gravel (8/16) pack from base of the well to 0.5 m above the screen.
Casing Seal	0.1 m of activated bentonite placed on top of the filter pack. Grouted from the bentonite layer to the ground surface.	0.1 m of activated bentonite placed on top of the filter pack. Grouted from the bentonite layer to the ground surface.	0.1 m of activated bentonite placed on top of the filter pack. Grouted from the bentonite layer to the ground surface.
Well Cover	Flush mounted "Gatic" road cover.	Flush mounted "Gatic" road cover.	Flush mounted "Gatic" road cover.

8.3 Groundwater sampling methodology

Groundwater samples were collected by an experienced GHD environmental professional in accordance with GHD's standard operating procedures for groundwater sampling and in accordance with SA EPA guidelines for regulatory monitoring and testing – groundwater sampling (April 2019).

All groundwater wells were left for a minimum of seven days following well development to allow for the stabilisation of aquifer conditions. Groundwater sampling was conducted on 26 October 2023.

All groundwater wells were gauged prior to sampling. The standing water levels were measured from the top of the well casing using an interface probe. The well gauging was undertaken using a water-product interface meter to check for the potential presence of any Light Non-Aqueous Phase Liquid (LNAPL).

All monitoring wells were purged and sampled using a low flow sampling technique (micropurge/peristaltic pump). During purging field water quality parameters were collected including pH, redox potential, dissolved oxygen, electrical conductivity and temperature to ensure stable conditions prior to sample collection.

Groundwater samples were collected in appropriate containers provided by the analytical laboratory suitable for PFAS analysis. The samples were stored in a chilled portable cooler immediately following sampling and were delivered under similar conditions to the analytical laboratory with accompanying chain of custody documentation.

The groundwater gauging and sampling records are provided in Appendix J.

8.4 Groundwater analytical program

The laboratories used for the soil investigation were ALS Laboratory Group (ALS) (primary laboratory) and Eurofins (secondary laboratory). Both laboratories are registered by the National Association of Testing Authorities (NATA) and the analyses conducted were within their NATA registration.

All groundwater samples were subject to PFAS long-suite analyses with a standard limit of reporting (LOR). QA/QC samples (field blanks, rinsate blanks and duplicate pairs) were also analysed as part of quality control protocol.

8.5 Groundwater investigation results

8.5.1 Subsurface conditions

Fill material was comprised of sandy material which alters sequentially into gravelly sand or silty sand at succeeding depths. Top fill material horizon was composed of fine to coarse grained sand with distinguishing orange-brown colour. Gravelly sand fill was encountered on the MW02 bore. This horizon was about 0.8 m layers of loose and poorly graded tan coloured fine to medium sandy material with gravel size clastics. The underlying sandy fill was a thin horizon of fine sand and/or likely silty in some bores with a distinguishable dark brown colour and minor gravel component. This horizon indicates the contact between the fill material and the natural soil.

Natural soil was encountered at 0.7 m bgl and likely extensive at greater depths. Generally, the natural soil was composed of poorly graded, low to medium plasticity, and fine to medium grained sandy clay materials. Mottling and shell fragment embeds were distinctive within some sandy lenses. Coloration of the material progressed from hues of dark brown to pale grey.

No evidence of staining nor the presence of any distinguishable olfactory odours were noted during sampling. Groundwater well drilling logs are presented in Appendix D.

8.5.2 Groundwater levels and inferred groundwater flow

Groundwater levels in the wells were gauged from the marked point on the well casing on 26 October 2023 using an electronic interface water level meter. The groundwater gauging sheets are attached in Appendix J. The well survey results are provided in Appendix I. The groundwater levels are presented in Table 8.2.

Table 8.2 Relative Groundwater Levels (AHD)

Well ID	Surveyed top of casing (m AHD)	Surveyed Ground Level (m AHD)	Depth to Groundwater (m btoc)	Relative groundwater level (m AHD)
MW01	1.130	1.236	2.010	-0.880
MW02	1.136	1.219	1.979	-0.843
MW03	1.137	1.203	1.894	-0.757

The groundwater gauging results were used to construct a groundwater contour map shown on Figure 4. Groundwater was inferred to flow in a north westerly direction, which is consistent with the expected regional groundwater flow and previous records.

8.5.3 Field measured water quality parameters

Groundwater samples were collected on 26 October 2023. Hydrogen sulphide odours were noted in purged groundwater at MW01 and MW02. No sheen was noted across the three sampled wells.

Groundwater quality parameters were monitored during purging and before sampling. The final values of these parameters prior to sampling are summarised in Table 7.3.

Table 8.3 Field Measured Groundwater Quality Parameters

Well ID	Date Sampled	Temp (°C)	pH	Dissolved oxygen (mg/L)	Oxidation - reduction potential (mV)	Total Dissolved Solids (mg/L)	Electrical conductivity (µS/cm)
MW01	26/10/2023	20.4	6.65	1.80	-202.5	13,715.84	21,431
MW02	26/10/2023	20.7	6.75	1.48	-198.2	7,112.32	11,113
MW03	26/10/2023	21.3	6.70	1.60	-174.9	11,264	17,600

Given the result of the in-situ physiochemical analysis, as shown on Table 7.3, the following observations were made:

- The shallow groundwater encountered at the site is relatively neutral with pH ranging between 6.65 and 6.75
- Groundwater is considered brackish given the high electrical conductivity values ranging between 11,113 µS/cm and 21,431 µS/cm
- Groundwater water is considered moderately to very saline given the yielded TDS values for each well ranging from 3000 mg/L to 34,000 mg/L

8.5.4 Analytical results

A summary of exceedances to the adopted groundwater criteria is tabulated in Table 8.4. Results for MW03 were reported below the adopted assessment criteria.

Detailed analytical groundwater results are provided in Appendix G. The laboratory certificates of analysis are contained in Appendix F.

Table 8.4 Summary of Groundwater Exceedances Against Adopted Criteria

Location	Date	PFHxS (µg/L)	PFOS (µg/L)	PFOA (µg/L)	Sum of PFOS PFHxS (µg/L)
MW01	26/10/2023	1.44	0.02	0.11	1.46
MW02	26/10/2023	4.88	0.18	0.24	5.06

Notes:

Yellow depicts an exceedance of the PFAS NEMP 2.0 2020 Health Drinking Water criteria

Light green depicts exceedance of the PFAS NEMP 2.0 2020 Recreational Drinking Water criteria

Dark green depicts exceedance of ADWG 2011 (updated 2022) Recreational Water (domestic) criteria

Light blue depicts exceedance of PFAS NEMP 2.0 2020 Interim marine – 95% slightly-moderately disturbed system criteria

Dark blue depicts exceedance of PFAS NEMP 2.0 2020 Interim marine – 99% high conservation value system criteria

9. Quality Assurance and Quality Control

A detailed Quality Assurance and Control (QA/QC) assessment was completed for all analytical sample data, in order to determine whether it is of suitable quality on which to base the site assessment. This included the collection and review of inter- and intra-laboratory duplicates and rinsate blank samples.

The QA/QC assessment found that the majority GHD QA/QC Data Quality Indicators (DQIs) were within the specified requirements. Some PFAS compounds noted relative percentage difference (RPD) exceedances, however this is likely due to the low concentrations of PFAS compounds detected in the samples. The data is, therefore considered to be valid and of sufficient quality to rely on for the purpose and objectives of this assessment. A copy of the detailed QA/QC report is provided in Appendix K.

10. Conceptual Site Model

Fundamental to any contamination investigation is the development of a Conceptual Site Model (CSM), which is a description of the plausible mechanisms ('pathway'), by which people and ecology ('receptors') may be exposed to chemicals in the environment ('sources'). Potential risks to human health or the environment cannot occur unless there is a complete Source-Pathway-Receptor (SPR) linkage. Conversely, complete SPR linkages do not by default indicate a risk and the site investigation process is used to evaluate the extent of potential risks.

A tabular CSM can be found below in Table 10.1, with illustrations provided in Figure 7 and Figure 8.

Table 10.1 CSM for PFAS exposure – SPR linkage assessment

Potential Source	Potential Receptor	Exposure Pathway	Risk from exposure through SPR Linkages
On-site PFAS impacted soils	Site users, visitors, maintenance and construction workers	Direct dermal contact with contaminated soil	Unlikely SSHILs have been derived using exposure assumptions that reflect the typical usage pattern of MFS fire stations. PFAS concentrations in on-site soils were below the adopted criteria. It is considered unlikely that site users, visitors, maintenance or construction workers would be exposed to PFAS quantities detrimental to their health.
		Incidental ingestion of contaminated soil	
		Inhalation of contaminated soil or dust from disturbed soils	
	Ecosystem at, and immediately surrounding, the site	Direct contact with contaminated soil	Unlikely Exceedances of the adopted Tier 1 interim ecological criteria for indirect exposure- developed sites were noted in soil samples. Elevated PFOS concentrations were reported on soil samples gathered from, and just west of, the historical storage of PFAS area, historical training area, washdown area and on the adjacent unsealed grass area. Most of these areas are predominantly paved and unvegetated with some surrounded by patches of shrub, trees, and grass. Although a potentially complete SPR linkage exists, the site is not considered of high ecological value given it's situated within a built-up urban environment and most of the site is sealed.
		Ingestion of contaminated soil	
		Bioaccumulation through indirect contact	
	Groundwater beneath the site	Rainwater/surface runoff leaching impacted soil followed by migration through porous media into groundwater	Confirmed Analyses of the groundwater samples taken from the on-site monitoring wells yielded PFAS concentrations above the adopted PFAS criteria. It is likely that PFAS has percolated down to the relatively shallow groundwater (2.0-2.5 m bgl). In addition, transpiration (movement of water through plants) should also be considered as PFAS has a relative shallow depth concentration nature.
On-site PFAS impacted concrete and paved surfaces	Site users, visitors, maintenance and construction workers	Direct dermal contact with contaminated pavers, concrete or bitumen	Unlikely The site has a predominantly sealed surface covering which is in good condition (no evidence of dilapidation) and is inert in nature (not readily broken down unless disturbed). Furthermore, the paver sample yielded PFAS concentration below the adopted PFAS criteria. It is therefore considered unlikely that direct dermal contact or inhalation associated with site pavers (potentially contaminated with PFAS chemicals as a result of the use of AFFF during training activities) would present any adverse health conditions to site users, visitors, maintenance and construction workers
		Inhalation of contaminated dust	

	Soil and groundwater beneath the site	Rainwater/surface runoff leaching impacted soil followed by migration through porous media into groundwater	Unlikely Analyses of paver/concrete samples yielded results below to the adopted PFAS assessment criteria for human health and ecology. Concrete hardstand in historical source areas is therefore unlikely to present a significant PFAS-flux risk.
PFAS-impacted groundwater	People using groundwater for: domestic and drinking purposes	Consumption of contaminated groundwater	Possible Given the following: 1. Registered groundwater wells within 2.0 km radius of the site, in which 58 wells are registered domestic purposes and 66 registered wells with TDS values in groundwater below 1,200 mg/L, are considered suitable for domestic and primary irrigation purposes (Gov SA 2015). 2. Analyses of groundwater samples taken from on-site monitoring wells yielded PFAS concentrations which exceeded the adopted PFAS criteria. A potential SPR linkage is plausible however still subject to further investigation to confirm and delineate the extent/degree of PFAS in groundwater down-hydraulic gradient.
	People using groundwater for irrigation of edible vegetation with which they grow produce for consumption	Consumption of edible vegetation irrigated by contaminated groundwater	Possible Given the following: 1. Analyses of groundwater samples taken from the on-site monitoring wells yielded PFAS concentrations which exceeded the adopted PFAS criteria. 2. The median TDS value of groundwater within 2.0 km of the site was 1,451 mg/L, which is considered suitable for domestic and primary irrigation purposes (Gov SA 2015). 11 registered wells within a 2.0 km radius of the site had irrigation purposes. 3. Residential properties with gardens where fruit and/or vegetables could be grown are present within 2.0 km of the site. 4. PFAS has a relative shallow depth concentration nature posing a risk of indirect exposure through transpiration (movement of groundwater through plant). A potential SPR linkage is plausible however still subject to further investigation to confirm and delineate the extent/degree of PFAS in groundwater down-hydraulic gradient.
	People growing edible vegetation in open soil which may interact with groundwater	Consumption of PFAS impacted edible vegetation	On-site: No No fruit or vegetables are grown on-site.
	People using groundwater for recreational purposes such as filling of swimming pools	Incidental ingestion of contaminated groundwater	Possible Given the following: 1. Analyses of groundwater samples taken from on-site monitoring wells yielded PFAS concentrations which exceeded the adopted PFAS criteria for recreational water.

			2. Three wells within a 2.0 km radius of the site were identified for recreational use. A potential SPR linkage is plausible since groundwater PFAS impacts have been confirmed on-site; However, the extent/degree of PFAS in groundwater down-hydraulic gradient of the site is yet to be delineated.
	Down gradient off-site maintenance and sub-surface construction workers that contact PFAS contaminated groundwater	Direct dermal contact or incidental ingestion of contaminated groundwater	Unlikely Despite the extent of groundwater PFAS impacts yet to be vertically and laterally delineated, it is unlikely that down-gradient, off-site maintenance or sub-surface construction workers will incidentally ingest contaminated water in quantities and concentrations detrimental to their health.
	Freshwater ecosystem of Port Adelaide River	Direct contact and/or ingestion with contaminated groundwater. Bioaccumulation through the food chain.	Possible The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not yet been delineated; However, given the proximity of the Port Adelaide River and the inferred groundwater flow direction to the west of the site, there is the possibility of groundwater PFAS chemicals to discharge into the Port Adelaide River.
PFAS impacted surface waters (off-site)	People using surface waters for recreational activities (swimming)	Incidental ingestion of contaminated groundwater	Unlikely Although the local interaction of groundwater with marine waters is plausible, exposure of recreational users of coastal waters (e.g., swimmers and paddlers) to PFAS in quantities and concentrations detrimental to their health is considered negligible due to the dilution effect.
	People Fishing from surface waters	Consumption of PFAS contaminated biota	Possible The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not yet been delineated. Since groundwater-marine water interactions are possible, and given the propensity for PFAS to bioaccumulate in edible higher order of consumers, the exposure risk via this pathway cannot be discounted at this stage.
	Marine ecosystems downstream from the site	Discharge of PFAS impacted surface water into the marine environment	Possible Several surface soil samples collected on-site reported PFAS concentrations above the adopted soil assessment criteria. Considering the potential dissolution of soil-bound PFAS contaminants subsequent to surface applications or atmospheric deposition, a linkage between historical source areas and down-gradient receptors (marine ecosystems) may be completed via PFAS-impacted surface water runoff. Surface run-off is likely discharged to a local storm water system and subsequently the Port Adelaide River.

11. Discussion

11.1 PFAS soil impacts

11.1.1 Human health

The PFAS NEMP (2020) HIL B human health-based investigation levels for soil and SSHILs for the screening of PFAS contaminated soils at MFS sites (Metropolitan, Staffed) were used to assess potential human exposure to PFAS contaminated soils in line with the applicable soil accessibility. The HIL B investigation level assumes no potential use of soil for consumption of home-grown produce, such as dwellings with fully paved yard spaces. SSHILs have been derived using exposure assumptions that reflect the typical usage pattern of MFS fire stations, to allow for tailored assessment of the potential exposure risks that may be associated with the presence of PFAS in shallow soils (GHD 2023c).

No exceedances of human health HIL B or SSHIL assessment criteria were reported during the investigation. The vertical and lateral extent of PFAS impacts have been delineated to the adopted assessment criteria for current site use (i.e., HIL B and MFS metropolitan staffed stations). The potential risks to human health for the current site use are considered low and acceptable.

11.1.2 Ecological

The PFAS NEMP 2.0 (2020) direct and indirect ecological exposure risk values for PFOS are protective of organisms that are in direct contact with soil (i.e., plants and worms) and secondary consumers (i.e., birds, small mammals and reptiles), respectively.

The PFAS NEMP (2020) indirect ecological exposure value of 0.01 mg/kg is a default value derived for all land use scenarios. However, the PFAS NEMP (2020) also states that this guideline value may be overprotective and site-specific characteristics may justify the use of a higher value (0.14 mg/kg), for example in scenarios where a site is located within an extensively built-up urban setting. The default value of 0.01 mg/kg is therefore not considered relevant as the site does not provide high quality foraging habitat for higher trophic level organisms.

The soil dataset identified PFOS concentrations above the adopted assessment criteria for indirect ecological exposure in eight sample locations (detailed in Table 6.3), which included five soil bores samples and three surface soil samples. PFOS exceedances were generally from soils situated under sealed pavement areas in the southwest portion of the site, within the areas historically used for training, appliance washdown and historical PFAS storage. The presence of PFAS concentrations in the underlying soils is likely attributed to the gradual leaching from pavements covering the historical training area. Exceedances were generally within near surface soils, ranging from 0.08 m bgl to 0.7 m bgl within the fill profile. Considering that concrete is a porous material, PFAS is likely to continue leaching when it comes into contact with water, such as during rainfall, when washing vehicles or overspray when watering plants. However, a complete SPR linkage would be implausible as the impacted soil is beneath a sealed (paved) area. Further assessment would be required to assess the release of PFAS from impacted pavers at the site.

There were three surface soil locations with PFOS exceedances, two located on unsealed grass areas just west of the historic PFAS storage and training areas (SS04 and SS05) and one in the grass area in the eastern portion of the site (SS10). The reported exceedances are likely due to overspray of PFAS-containing AFFF during training exercises which then soaked into the unsealed ground.

11.2 PFAS paver impacts

It is noted that the results obtained from paver samples are indicative of worst-case flux conditions since samples were ground prior to analysis, with constituents no longer bound within a consolidated matrix. Under routine conditions, it is unlikely that pavers would deteriorate/erode to this fine-grained state which is conducive of enhanced PFAS leaching potential and exposure. Considering the results were below the adopted criteria, it can safely be concluded that pavers on-site do not constitute a significant PFAS source.

11.3 PFAS groundwater impacts

Exceedances of the adopted PFAS Interim Screening Criteria for human health and ecological protection were reported in the samples taken from MW01 and MW02. Per the CSM, exposure scenarios include the use of groundwater for drinking, recreational use and interim marine water species protection. The concentration values for PFHxS and PFOS are crucial determinants for the exceedances in the adopted criteria.

Considering the points below, a potential SPR linkage for on-site and off-site groundwater is plausible:

- Groundwater samples taken from the on-site monitoring wells yielded PFAS concentrations in exceedance of the assessment criteria
- Presence of registered groundwater wells within 2.0 km radius of the site, in which 58 wells were registered for domestic purposes and 66 wells had TDS values in groundwater below 1,200 mg/L, which is considered the threshold for domestic and primary irrigation purposes (Gov SA 2015)
- Residential properties with gardens where fruit and/or vegetables may be grown are present down-gradient of the site
- The relative shallow depth concentration nature of PFAS likely posing an indirect exposure through transpiration (movement of groundwater through plants)
- North-west inferred groundwater flow direction to the Port Adelaide River

Whilst a potential SPR linkage for on-site and off-site groundwater is plausible, further investigation to confirm PFAS presence in groundwater down-hydraulic gradient is required. The extent/degree of PFAS in groundwater down-hydraulic gradient of the site has not yet been delineated but given the proximity of the site to the Port Adelaide River and relatively shallow groundwater depth, the interaction of groundwater with surface waters via direct discharge cannot be discounted.

12. Conclusions and recommendations

Based on the results of this investigation the following conclusions have been made:

- The encountered lithologies underlain the site are consistent with Saint Kilda Formation, consisting of coastal marine sediment characterised by calcareous, fossiliferous sand and mud of intertidal sand flats, beaches and tidal marshes; organic, gypseous clay of supratidal flats
- PFAS impacts in soil at the site are most likely related to historical firefighting activities including training and storage of PFAS-containing AFFF
- Regarding reported soil results:
 - The highest concentrations of PFAS in soils were reported in BH04 (0.2-0.3 m bgl) within the historical training area and washdown area
 - No exceedances of human health HIL B or SSHILs assessment criteria were reported during the investigation
 - The site in its current condition is considered suitable for ongoing commercial/industrial use due to assessment results below HIL B and SSHILs criteria. The potential risks to human health for the current site use are considered low and acceptable
 - Eight exceedances of the tier 1 ecological indirect exposure were reported. Seven of the eight exceedances were reported in samples collected in the southwest portion of the site within the historical training area, washdown area and near the historical storage for PFAS. The remaining exceedance (SS10) was located on the unsealed grass in the eastern portion of the site. The presence of ecological exposure risks requires further assessment work to close out potential impacts to both potential on-site and off-site receptors
 - PFAS soil impacts have been delineated vertically to a depth of approximately 0.7 m bgl across the site
- Regarding reported paver results:
 - The paver samples (BH04_PAVER and BH07_PAVER) yielded PFAS concentrations below the adopted PFAS Interim Screening Criteria
- Regarding reported groundwater results:
 - Exceedances on the adopted PFAS Interim Screening Criteria representing exposure scenarios for domestic and recreational use groundwater was reported for PFHxS and PFOS in the samples taken from monitoring wells MW01 and MW02
 - A potential SPR linkage for on-site and off-site groundwater is plausible, further investigation to confirm PFAS presence in groundwater down-hydraulic gradient is required
 - The extent/degree of PFAS present in groundwater down-hydraulic gradient of the site has not yet been delineated but given the proximity of the site to the Port Adelaide River and relatively shallow groundwater depth, the interaction of groundwater with surface waters via direct discharge cannot be discounted

The following recommendations have been made:

- Further intrusive works to delineate the nature and spatial extent of the contamination off-site to the north-west
- Installation of a series of off-site groundwater monitoring wells (one up-hydraulic gradient and three down-hydraulic gradient, progressively further away from site) to assess the lateral extent of groundwater impacts and potential marine and terrestrial ecosystem exposure risks via the groundwater pathway
- Conduct a groundwater-use survey within the vicinity of the site to evaluate the potential exposure risk attributable to the possible use of groundwater for currently unidentified domestic/recreational purposes

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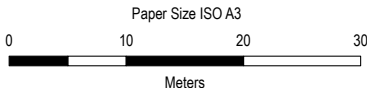
Figures

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<i>Figure 2</i>	<i>Historical Sampling Locations Plan</i>
<i>Figure 3</i>	<i>Soil and Groundwater Monitoring Locations Plan</i>
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<i>Figure 7</i>	<i>Cross Section CSM</i>
<i>Figure 8</i>	<i>Source Pathway Receptor CSM</i>



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Horizontal Datum: GDA 1994
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South Australian Metropolitan Fire Service
MFS Port Adelaide Detailed Site Investigation

Project No. 12616804
Revision No. A
Date 13/11/2023

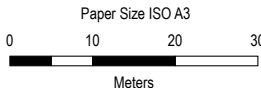
Port Adelaide Site Location Plan

FIGURE 1

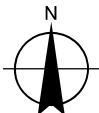


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Port Adelaide Historical
Sampling Locations Plan

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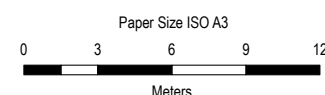
FIGURE 2



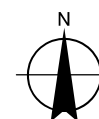
- Legend**
- ⊕ Groundwater Monitoring Wells
 - ⊕ Soil Boreholes
 - ⊕ Surface Soil Samples
 - Stormwater Pits
 - Roads
 - ⌈ Historical Storage of PFAS
 - ⌈ Historical Training Area
 - ⌈ Wash Down Area
 - ⌈ 16,000L Diesel UST Site
 - Boundary
 - Cadastre

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**Port Adelaide Soil and Groundwater
Monitoring Locations Plan**

Project No. **12616804**
Revision No. **A**
Date **15/11/2023**

FIGURE 3

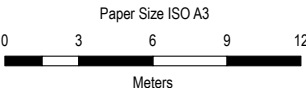
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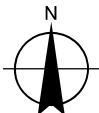


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MFS Port Adelaide Detailed Site Investigation

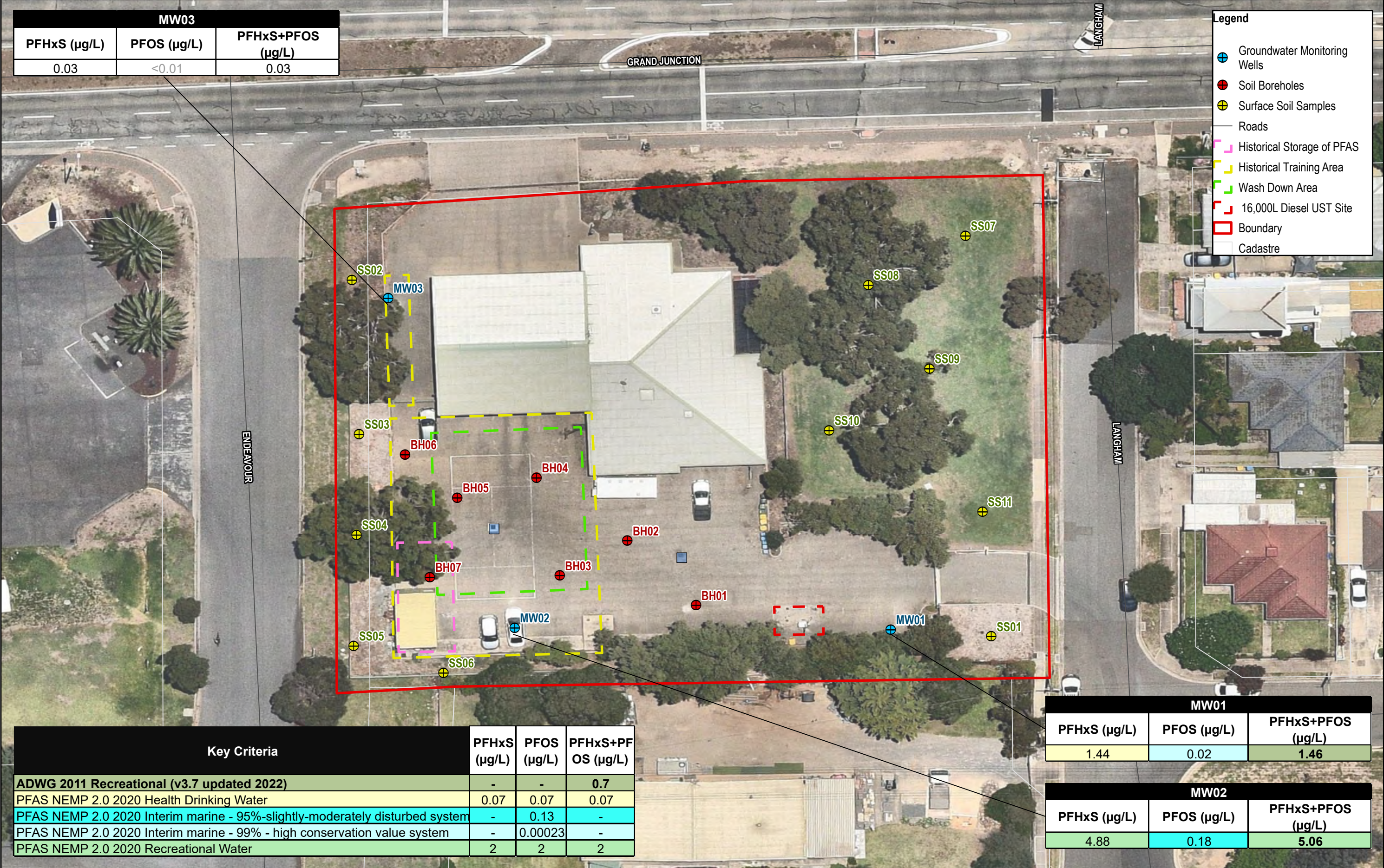
Port Adelaide
Groundwater Contour Map

Project No. 12616804
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Date 17/11/2023

FIGURE 4

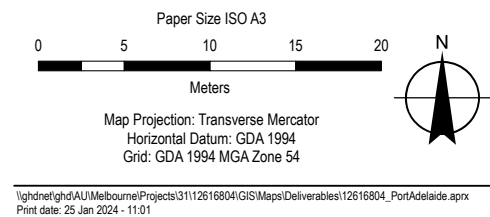
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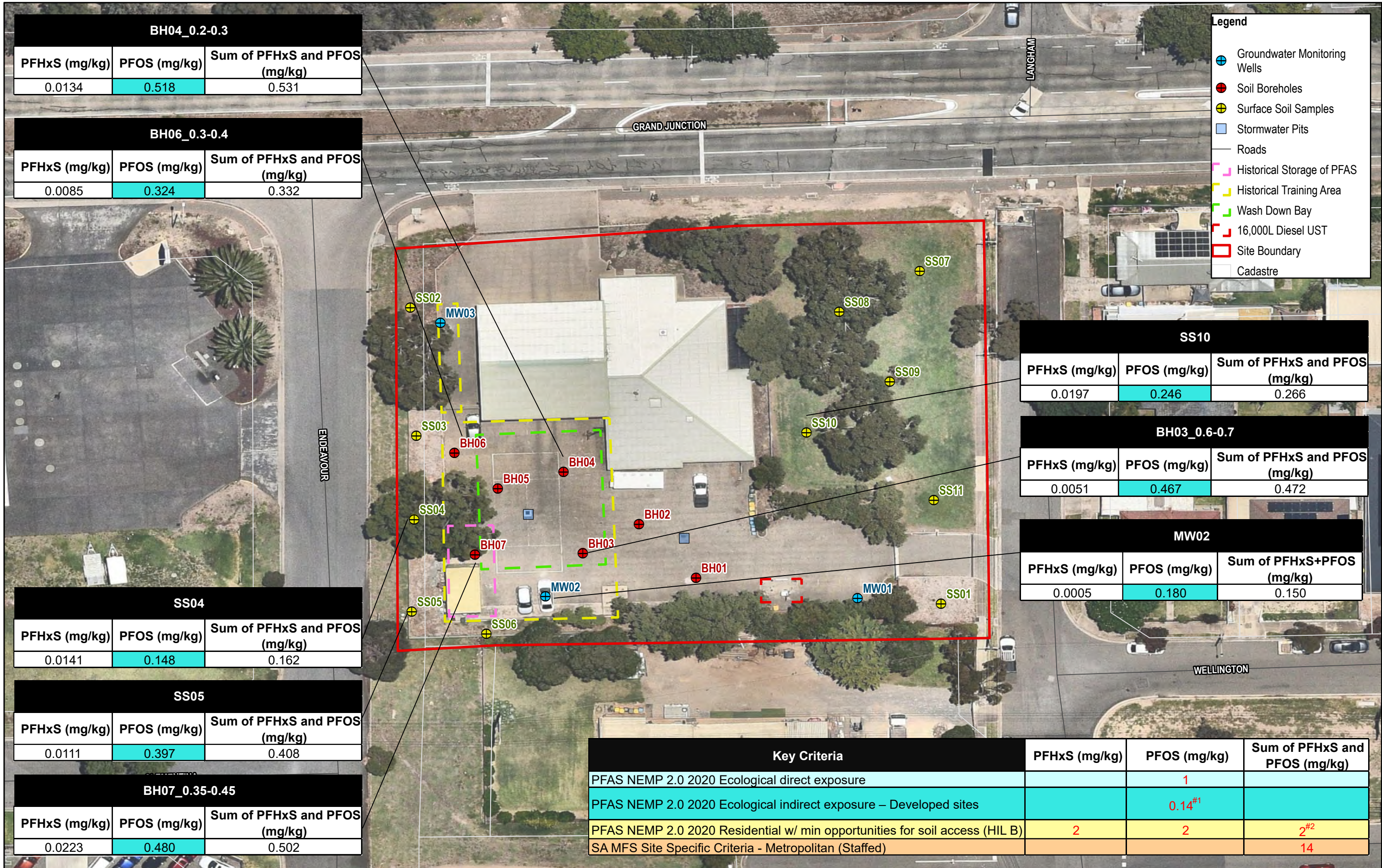
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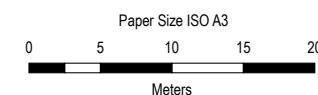
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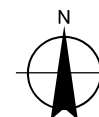


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South Australian Metropolitan Fire Service
MFS Port Adelaide Detailed Site Investigation

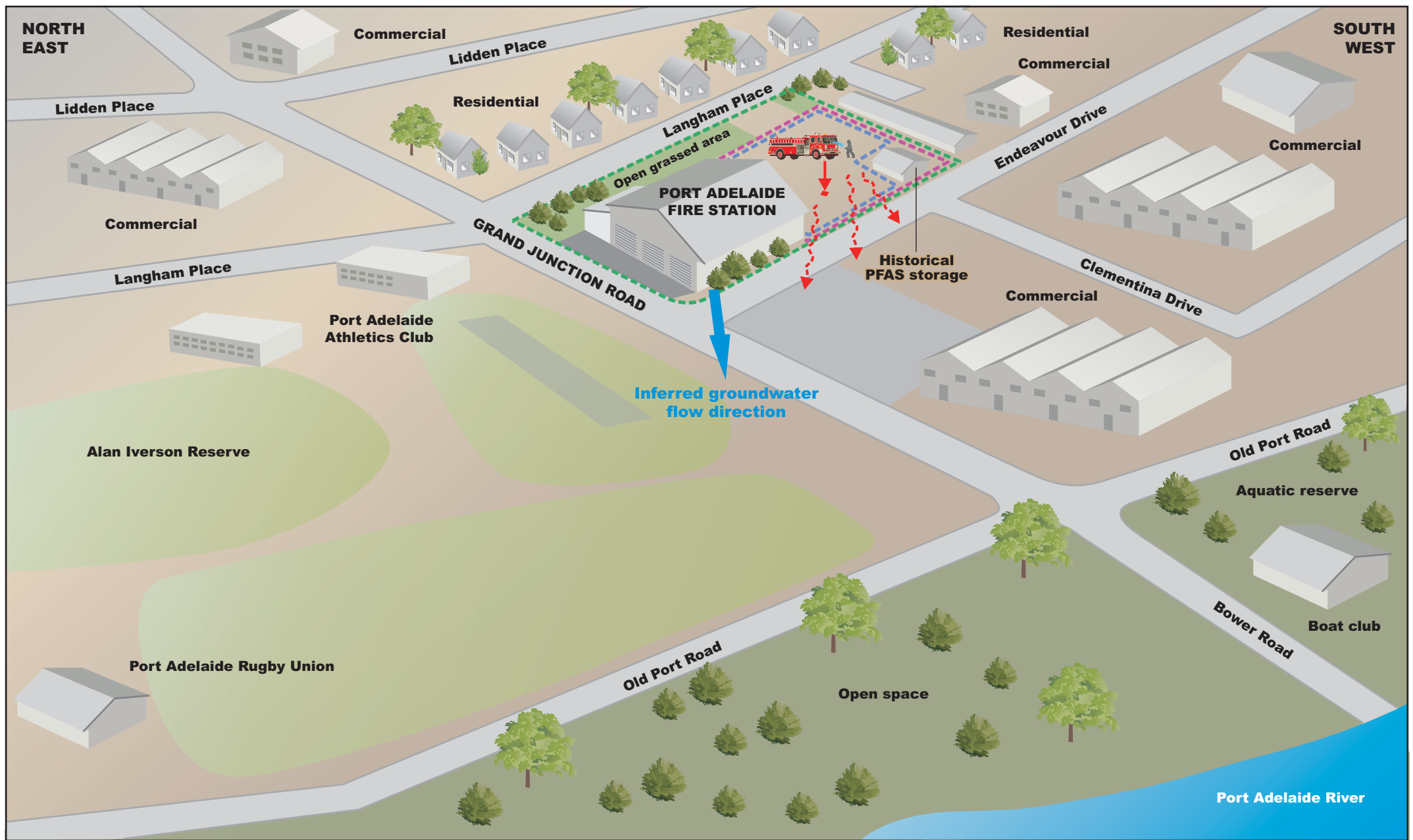
Port Adelaide Soil
Exceedances of Adopted Criteria

Project No. 12616804
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FIGURE 6

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LEGEND

- Site boundary
- Historical training area
- Washdown area

- PFAS migrating vertically to groundwater
- Stormwater drain
- Discharge of PFAS run-off to stormwater drains

Conceptual diagram only -
not to scale



SA MFS
Port Adelaide DSI
456 Grand Junction Road, Cnr Grand Junction Road and
Langham Place, Port Adelaide, SA 5015

Conceptual site model cross section

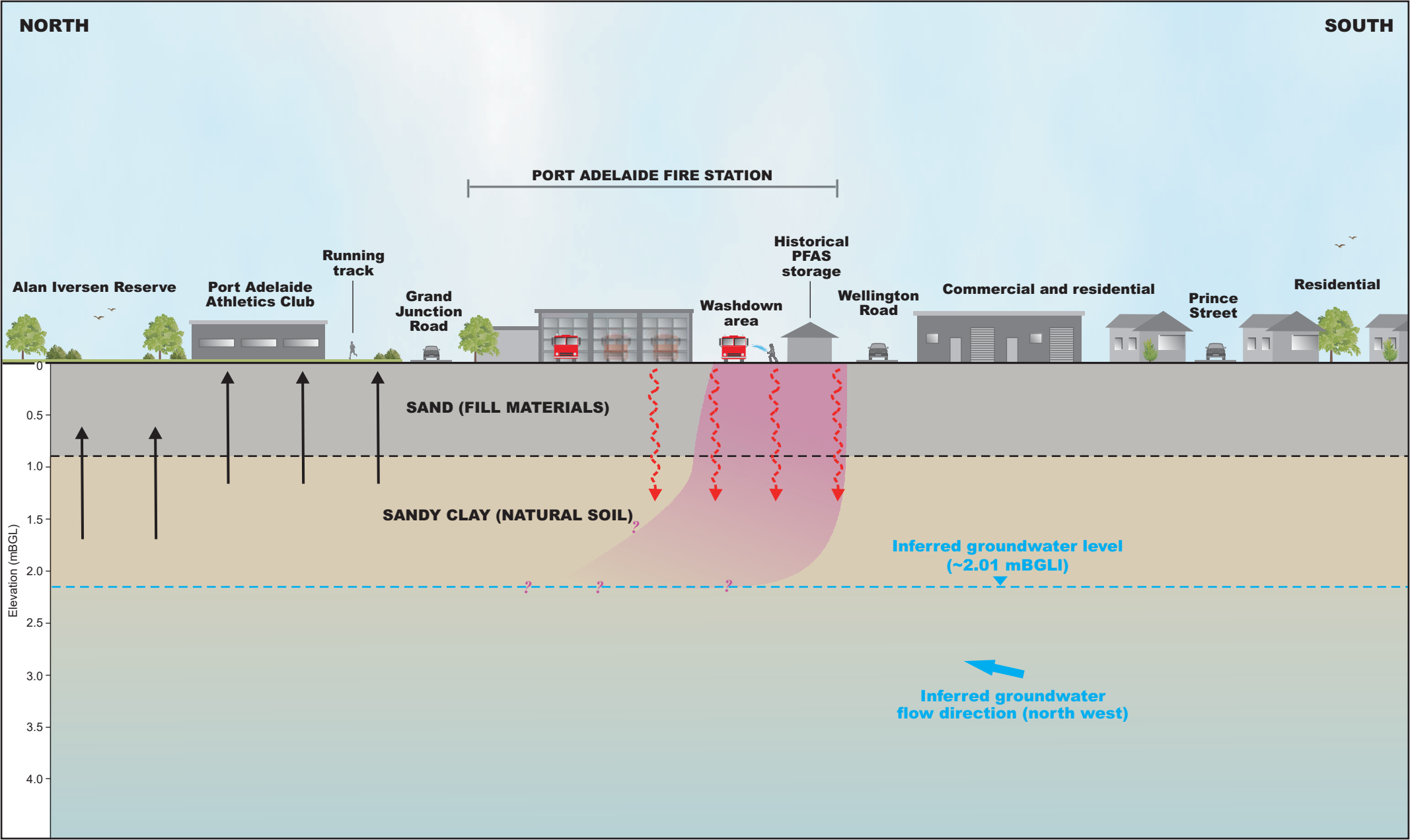
Project No. 12616805
Revision No. A
Date 29/11/2023

FIGURE 7

AU\Launceston\Projects\Admin\Graphics\12616805\12616805_LST_01.cdr

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Level 4, 211 Victoria Square Adelaide SA 5000 T 61 8 8111 6600 F 61 8 8111 6699 E ademall@ghd.com W www.ghd.com



- LEGEND
- PFAS biotic uptake
 - PFAS impacted surface runoff infiltration
 - Inferred PFAS point sources

Conceptual diagram only -
scale is approximate



SA MFS
Port Adelaide DSI
456 Grand Junction Road, Cnr Grand Junction
Road and Langham Place, Port Adelaide, SA 5015
Conceptual site model cross section

Project No. 12616804
Revision No. A
Date 29/11/2023

FIGURE 8

Appendices

Appendix A

SA EPA Letter

OFFICIAL



Environment Protection Authority

GPO Box 2607 Adelaide SA 5001

T (08) 8204 2004

Country areas 1800 623 445

EPA GENI 62917

Krystle Mitchell

Senior Scientific and Environmental Officer

South Australian Metropolitan Fire Service

By Email: Krystle.Mitchell@eso.sa.gov.au

Dear Ms Mitchell,

RE: REVIEW OF SITE CONTAMINATION REPORT – ACTION REQUIRED

Site: Various Metropolitan Fire Service (MFS) Fire Stations, South Australia

Thank you for providing the Environment Protection Authority (EPA) with a copy of the following report:

- *MFS 17 Fire Stations PFAS Risk Profiling*, prepared by GHD and dated 26 October 2022.

The above report documents a desktop risk profiling and prioritisation assessment completed for 17 MFS stations previously identified as containing PFAS contamination, based on limited site sampling completed in 2019 (GHD 2019)¹.

The EPA requests that you submit a plan of proposed works and associated timelines to address the highest risk sites by **30 June 2023**.

If you agree to undertake the above listed works it is requested that you submit written acknowledgement to the EPA stating as such. If you wish to discuss potential alterations to the recommended works or delivery date please contact the EPA as soon as possible.

It is not clear in the above report whether stations where no soil sampling was completed, or where the limited sampling showed no site contamination, were considered as part of the risk screening assessment. The EPA notes that the sampling documented in GHD (2019) was highly limited and may not capture all potential PFAS source areas at a station. The EPA recommends that these stations be risk profiled if not undertaken previously.

Please provide a copy of this letter to your engaged consultant to assist them in developing a scope of works for the relevant sites. Fact sheets relating to your obligations under the *Environment Protection Act 1993* and how to engage a site contamination consultant be found at www.epa.sa.gov.au. If you would like further assistance on this matter please contact Brooke Ryan on (08) 8204 8525 or at brooke.ryan2@sa.gov.au.

Yours sincerely

A handwritten signature in cursive script that reads 'H Custance'.

Hannah Custance

PRINCIPAL ADVISER, SITE CONTAMINATION

ENVIRONMENT PROTECTION AUTHORITY

Date: 1 February 2023

Cc: Ben Petticrew, Technical/Project Director – Contamination Assessment and Remediation, GHD (ben.petticrew@ghd.com)

¹ *MFS State Wide Appliance and Station Sampling*, prepared by GHD and dated May 2019.

Appendix B

Photolog

Port Adelaide Fire Station



Photo 1 View of Entrance, facing S, from Grand Junction Rd



Photo 2 Rear recreation area and washdown bay, facing north



Photo 3 Storage shed in SE corner, taken from rear of building, facing south east



Photo 4 View of wash down bay facing south west



Photo 5 View of surrounding property, Pay Dirt excavations



Photo 6 View vehicle access and drain from Langham Pl, facing W

Appendix C

MFS Surveys

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF (*aqueous film-forming foam, firefighting foam*) occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Adelaide SAMFS Fire Station

Name: REDACTED

Position when working at the site: S/O

Phone number: REDACTED

Email: REDACTED

Date of response: 07/01/22

Item	Question	Response
1	When did you start working at this station?	2016
2	How long have you worked at this station?	4
3	Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?	stormwater pit
4	Can you describe any changes in how stormwater has been managed at the site over time?	nil
5	Is stormwater harvested within the site?	no
5.1	If yes, please describe where and how stormwater is harvested.	
5.2	For what purposes is stormwater harvested?	
6	Are there groundwater wells / bores at the site?	no
6.1	If yes, for what purpose is groundwater used at the site?	

Item	Question	Response
6.2	<i>Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.</i>	
7	<i>Date when AFFF was first used on site?</i>	unsure
8	<i>Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)</i>	none used on site since my arrival
9	<i>Was AFFF used in regular training exercises? If so:</i>	no
9.1	<i>How often was the training? (e.g. weekly, monthly, quarterly)</i>	n/a
9.2	<i>Can you describe the location of the training areas and annotate them on the site plan?</i>	n/a
9.3	<i>Can provide an estimate of how much AFFF was used in each training?</i>	n/a
9.4	<i>Was the training ground sealed / open?</i>	n/a
9.5	<i>Was AFFF dispersed aerially? If so, please indicate the maximum extent on the site plan?</i>	n/a
9.6	<i>When was the date of the last training event that included the use of AFFF?</i>	n/a
10	<i>Please describe how the waste water was managed following training events? Specifically, was there a recycling system, storage pond, storage tanks or drains? Please annotate waste water discharge point / pathways on the site plan.</i>	n/a
11	<i>Did any waste water flow into drains that directed the waste water off-site? Please annotate the waste water discharge points / pathways on the site plan.</i>	n/a
12	<i>Were there any changes how the waste water was managed over time? If so, please describe the changes.</i>	
13	<i>Is there any inventory of AFFF use for the site?</i>	no

Item	Question	Response
14	Can you estimate the total volume of AFFF used on site before it was phased out in 2016?	no
15	Where was AFFF stored on site? Please annotate the storage location on the site plan.	possibly
15.1	What type and size of storage containers were used to store AFFF on site?	on appliance and possible on foam pod in 200lt drums
15.2	What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?	10-20 unsure
16	Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances. What equipment was used to transfer the AFFF?	n/a
17	How were spent drums of AFFF disposed of?	n/a
18	Were there any wash down areas for fire trucks, equipment or AFFF containers? If so:	no
18.1	How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)	n/a
18.2	Were there any changes how the waste water was managed over? If so, please describe the changes.	no
19	Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.	
20	Is there an incident log / register for the site?	n/a

Item	Question	Response
21	<i>Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:</i>	no
21.1	<i>When did such release(s) happen?</i>	n/a
21.2	<i>What substance(s) was/were released?</i>	n/a
21.3	<i>Where did such release(s) happen? Please annotate the release point(s) on the site plan.</i>	n/a
21.4	<i>Where was the released AFFF or chemical discharged to? Please annotate the discharge point(s) on the site plan.</i>	n/a
22	<i>Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?</i>	possibly - unsure
23	<i>Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?</i>	unsure
24	<i>Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.</i>	none that i am aware of

Any other comments or notes.

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF (*aqueous film-forming foam, firefighting foam*) occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Adelaide SAMFS Fire Station

Name: REDACTED

Position when working at the site: F/F S/F

Phone number: REDACTED

Email:

Date of response: 03/07/22

Item	Question	Response
1	When did you start working at this station?	2011/2012
2	How long have you worked at this station?	10-11 YEARS
3	Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?	stormwater is discharged to street and stormwater system. i suspect this may run into catchment pond approx 250m to the west of the station
4	Can you describe any changes in how stormwater has been managed at the site over time?	nil
5	Is stormwater harvested within the site?	no
5.1	If yes, please describe where and how stormwater is harvested.	
5.2	For what purposes is stormwater harvested?	
6	Are there groundwater wells / bores at the site?	no
6.1	If yes, for what purpose is groundwater used at the site?	

Item	Question	Response
6.2	<i>Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.</i>	
7	<i>Date when AFFF was first used on site?</i>	?
8	<i>Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)</i>	
9	<i>Was AFFF used in regular training exercises? If so:</i>	I am not aware of any regular training occurring using AFFF
9.1	<i>How often was the training? (e.g. weekly, monthly, quarterly)</i>	
9.2	<i>Can you describe the location of the training areas and annotate them on the site plan?</i>	
9.3	<i>Can provide an estimate of how much AFFF was used in each training?</i>	
9.4	<i>Was the training ground sealed / open?</i>	
9.5	<i>Was AFFF dispersed aerially? If so, please indicate the maximum extent on the site plan?</i>	
9.6	<i>When was the date of the last training event that included the use of AFFF?</i>	
10	<i>Please describe how the waste water was managed following training events? Specifically, was there a recycling system, storage pond, storage tanks or drains? Please annotate waste water discharge point / pathways on the site plan.</i>	
11	<i>Did any waste water flow into drains that directed the waste water off-site? Please annotate the waste water discharge points / pathways on the site plan.</i>	
12	<i>Were there any changes how the waste water was managed over time? If so, please describe the changes.</i>	
13	<i>Is there any inventory of AFFF use for the site?</i>	I am not aware of an inventory for AFFF use at the site

Item	Question	Response
14	<i>Can you estimate the total volume of AFFF used on site before it was phased out in 2016?</i>	
15	<i>Where was AFFF stored on site? Please annotate the storage location on the site plan.</i>	Stored on a skid pod. Southern boundary of station car park on a 100mm raised cement slab
15.1	<i>What type and size of storage containers were used to store AFFF on site?</i>	~200L blue plastic drums
15.2	<i>What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?</i>	approx 24 drums would be my estimate
16	<i>Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances. What equipment was used to transfer the AFFF?</i>	Never saw this occur.
17	<i>How were spent drums of AFFF disposed of?</i>	
18	<i>Were there any wash down areas for fire trucks, equipment or AFFF containers? If so:</i>	no
18.1	<i>How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)</i>	
18.2	<i>Were there any changes how the waste water was managed over? If so, please describe the changes.</i>	
19	<i>Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.</i>	
20	<i>Is there an incident log / register for the site?</i>	

Item	Question	Response
21	<i>Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:</i>	no
21.1	<i>When did such release(s) happen?</i>	
21.2	<i>What substance(s) was/were released?</i>	
21.3	<i>Where did such release(s) happen? Please annotate the release point(s) on the site plan.</i>	
21.4	<i>Where was the released AFFF or chemical discharged to? Please annotate the discharge point(s) on the site plan.</i>	
22	<i>Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?</i>	
23	<i>Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?</i>	no
24	<i>Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.</i>	foam was no longer stored at the station from approx 2016.

Any other comments or notes.



MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF (*aqueous film-forming foam, firefighting foam*) occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Adelaide SAMFS Fire Station

Name:

Position when working at the site:

Phone number:

Email:

Date of response:

Fire fighter

20/6/22

U

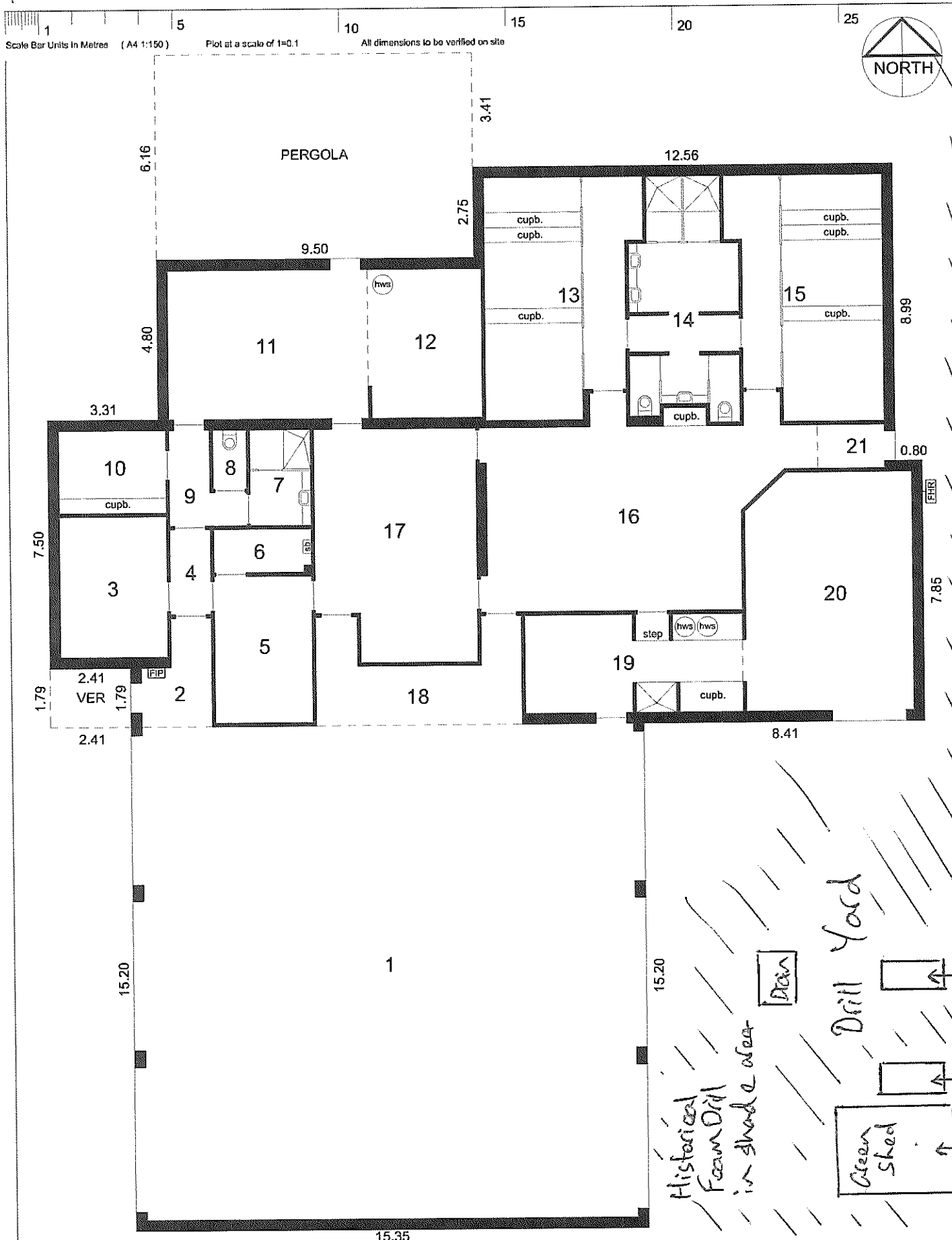
Item	Question	Response
1	When did you start working at this station?	1987
2	How long have you worked at this station?	30 years including relieving
3	Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?	Storm water pit
4	Can you describe any changes in how stormwater has been managed at the site over time?	None that I am aware of.
5	Is stormwater harvested within the site?	No.
5.1	If yes, please describe where and how stormwater is harvested.	—
5.2	For what purposes is stormwater harvested?	—
6	Are there groundwater wells / bores at the site?	No
6.1	If yes, for what purpose is groundwater used at the site?	Not applicable

Item	Question	Response
6.2	Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.	Not applicable
7	Date when AFFF was first used on site?	Early 80's
8	Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)	
9	Was AFFF used in regular training exercises? If so:	Yes
9.1	How often was the training? (e.g. weekly, monthly, quarterly)	Annually
9.2	Can you describe the location of the training areas and annotate them on the site plan?	
9.3	Can provide an estimate of how much AFFF was used in each training?	Up to 100 litres
9.4	Was the training ground sealed / open?	Open
9.5	Was AFFF dispersed aerially? If so, please indicate the maximum extent on the site plan?	
9.6	When was the date of the last training event that included the use of AFFF?	Mid 1990's
10	Please describe how the waste water was managed following training events? Specifically, was there a recycling system, storage pond, storage tanks or drains? Please annotate waste water discharge point / pathways on the site plan.	No recycling or storage at site.
11	Did any waste water flow into drains that directed the waste water off-site? Please annotate the waste water discharge points / pathways on the site plan.	Yes
12	Were there any changes how the waste water was managed over time? If so, please describe the changes.	None that I am aware of.
13	Is there any inventory of AFFF use for the site?	No.

Item	Question	Response
14	Can you estimate the total volume of AFFF used on site before it was phased out in 2016?	Unknown.
15	Where was AFFF stored on site? Please annotate the storage location on the site plan.	Yes
15.1	What type and size of storage containers were used to store AFFF on site?	200 litre drums. Metal later replaced by Plastic drums.
15.2	What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?	24 x 200 litre Drums
16	Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances. What equipment was used to transfer the AFFF?	Foam ~~eq~~ equipment such as large Foam Canon and and Inductor lines were stored in a trailer as per plan
17	How were spent drums of AFFF disposed of?	Unknown.
18	Were there any wash down areas for fire trucks, equipment or AFFF containers? If so:	Rear yard.
18.1	How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)	No recycling. Discharged to drains.
18.2	Were there any changes how the waste water was managed over? If so, please describe the changes.	None that I am aware of.
19	Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.	Underground diesel fuel storage tank Easter side of yard
20	Is there an incident log / register for the site?	Yes. Doesn't capture historical AFFF use.

Item	Question	Response
21	Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:	No
21.1	When did such release(s) happen?	Not applicable
21.2	What substance(s) was/were released?	N/A.
21.3	Where did such release(s) happen? Please annotate the release point(s) on the site plan.	—
21.4	Where was the released AFFF or chemical discharged to? Please annotate the discharge point(s) on the site plan.	In waste water to drains
22	Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?	Area behind green storage shed where foam was stored.
23	Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?	No.
24	Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.	None.

Any other comments or notes.



Asset Name PORT ADELAIDE SAMFS					 Government of South Australia Department for Transport, Energy and Infrastructure	
Building Use FIRE STATION						
Created by.	<i>Archink</i>	Drawn	<i>A Bentley</i>	Date	<i>Apr 2010</i>	Strategic Asset Management Information System Plan
Modified by.	-	Drawn	-	Date	-	
Bldg area m²	<i>611</i>	Ver area m²	<i>4</i>	Plan ref.	<i>7811-WD1</i>	
SAMIS 09166-01-1						

16000 L Diesel VST

6 incidents over 1 shift over 30 years used foam
→ wash out lines afterwards

- Cleanaway
- car fires (alloy blocks, 17g wheels)

Foam cannon → set and dripped next to storage shed
post learning use

- 150L AFFF instead of high-expansion foam 1 incident
150-120L Appliances → accidental release

- 1 incident AFFF instead of training foam
Knee deep blanket of foam

- regular appliance testing → release of small amounts
of foam

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF (*aqueous film-forming foam, firefighting foam*) occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Adelaide SAMFS Fire Station

Name: REDACTED

Position when working at the site: F/F S/F

Phone number: REDACTED

Email:

Date of response: 03/07/22

Item	Question	Response
1	<i>When did you start working at this station?</i>	2011/2012
2	<i>How long have you worked at this station?</i>	10-11 YEARS
3	<i>Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?</i>	stormwater is discharged to street and stormwater system. i suspect this may run into catchment pond approx 250m to the west of the station
4	<i>Can you describe any changes in how stormwater has been managed at the site over time?</i>	nil
5	<i>Is stormwater harvested within the site?</i>	no
5.1	<i>If yes, please describe where and how stormwater is harvested.</i>	
5.2	<i>For what purposes is stormwater harvested?</i>	
6	<i>Are there groundwater wells / bores at the site?</i>	no
6.1	<i>If yes, for what purpose is groundwater used at the site?</i>	

Item	Question	Response
6.2	<i>Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.</i>	
7	<i>Date when AFFF was first used on site?</i>	?
8	<i>Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)</i>	
9	<i>Was AFFF used in regular training exercises? If so:</i>	I am not aware of any regular training occurring using AFFF
9.1	<i>How often was the training? (e.g. weekly, monthly, quarterly)</i>	
9.2	<i>Can you describe the location of the training areas and annotate them on the site plan?</i>	
9.3	<i>Can provide an estimate of how much AFFF was used in each training?</i>	
9.4	<i>Was the training ground sealed / open?</i>	
9.5	<i>Was AFFF dispersed aerially? If so, please indicate the maximum extent on the site plan?</i>	
9.6	<i>When was the date of the last training event that included the use of AFFF?</i>	
10	<i>Please describe how the waste water was managed following training events? Specifically, was there a recycling system, storage pond, storage tanks or drains? Please annotate waste water discharge point / pathways on the site plan.</i>	
11	<i>Did any waste water flow into drains that directed the waste water off-site? Please annotate the waste water discharge points / pathways on the site plan.</i>	
12	<i>Were there any changes how the waste water was managed over time? If so, please describe the changes.</i>	
13	<i>Is there any inventory of AFFF use for the site?</i>	I am not aware of an inventory for AFFF use at the site

Item	Question	Response
14	<i>Can you estimate the total volume of AFFF used on site before it was phased out in 2016?</i>	
15	<i>Where was AFFF stored on site? Please annotate the storage location on the site plan.</i>	Stored on a skid pod. Southern boundary of station car park on a 100mm raised cement slab
15.1	<i>What type and size of storage containers were used to store AFFF on site?</i>	~200L blue plastic drums
15.2	<i>What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?</i>	approx 24 drums would be my estimate
16	<i>Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances. What equipment was used to transfer the AFFF?</i>	Never saw this occur.
17	<i>How were spent drums of AFFF disposed of?</i>	
18	<i>Were there any wash down areas for fire trucks, equipment or AFFF containers? If so:</i>	no
18.1	<i>How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)</i>	
18.2	<i>Were there any changes how the waste water was managed over? If so, please describe the changes.</i>	
19	<i>Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.</i>	
20	<i>Is there an incident log / register for the site?</i>	

Item	Question	Response
21	<i>Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:</i>	no
21.1	<i>When did such release(s) happen?</i>	
21.2	<i>What substance(s) was/were released?</i>	
21.3	<i>Where did such release(s) happen? Please annotate the release point(s) on the site plan.</i>	
21.4	<i>Where was the released AFFF or chemical discharged to? Please annotate the discharge point(s) on the site plan.</i>	
22	<i>Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?</i>	
23	<i>Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?</i>	no
24	<i>Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.</i>	foam was no longer stored at the station from approx 2016.

Any other comments or notes.

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF (*aqueous film-forming foam, firefighting foam*) occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Adelaide SAMFS Fire Station

Name: REDACTED

Position when working at the site: S/O

Phone number: REDACTED

Email: REDACTED

Date of response: 07/01/22

Item	Question	Response
1	When did you start working at this station?	2016
2	How long have you worked at this station?	4
3	Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?	stormwater pit
4	Can you describe any changes in how stormwater has been managed at the site over time?	nil
5	Is stormwater harvested within the site?	no
5.1	If yes, please describe where and how stormwater is harvested.	
5.2	For what purposes is stormwater harvested?	
6	Are there groundwater wells / bores at the site?	no
6.1	If yes, for what purpose is groundwater used at the site?	

Item	Question	Response
6.2	<i>Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.</i>	
7	<i>Date when AFFF was first used on site?</i>	unsure
8	<i>Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)</i>	none used on site since my arrival
9	<i>Was AFFF used in regular training exercises? If so:</i>	no
9.1	<i>How often was the training? (e.g. weekly, monthly, quarterly)</i>	n/a
9.2	<i>Can you describe the location of the training areas and annotate them on the site plan?</i>	n/a
9.3	<i>Can provide an estimate of how much AFFF was used in each training?</i>	n/a
9.4	<i>Was the training ground sealed / open?</i>	n/a
9.5	<i>Was AFFF dispersed aerially? If so, please indicate the maximum extent on the site plan?</i>	n/a
9.6	<i>When was the date of the last training event that included the use of AFFF?</i>	n/a
10	<i>Please describe how the waste water was managed following training events? Specifically, was there a recycling system, storage pond, storage tanks or drains? Please annotate waste water discharge point / pathways on the site plan.</i>	n/a
11	<i>Did any waste water flow into drains that directed the waste water off-site? Please annotate the waste water discharge points / pathways on the site plan.</i>	n/a
12	<i>Were there any changes how the waste water was managed over time? If so, please describe the changes.</i>	
13	<i>Is there any inventory of AFFF use for the site?</i>	no

Item	Question	Response
14	Can you estimate the total volume of AFFF used on site before it was phased out in 2016?	no
15	Where was AFFF stored on site? Please annotate the storage location on the site plan.	possibly
15.1	What type and size of storage containers were used to store AFFF on site?	on appliance and possible on foam pod in 200lt drums
15.2	What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?	10-20 unsure
16	Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances. What equipment was used to transfer the AFFF?	n/a
17	How were spent drums of AFFF disposed of?	n/a
18	Were there any wash down areas for fire trucks, equipment or AFFF containers? If so:	no
18.1	How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)	n/a
18.2	Were there any changes how the waste water was managed over? If so, please describe the changes.	no
19	Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.	
20	Is there an incident log / register for the site?	n/a

Item	Question	Response
21	<i>Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:</i>	no
21.1	<i>When did such release(s) happen?</i>	n/a
21.2	<i>What substance(s) was/were released?</i>	n/a
21.3	<i>Where did such release(s) happen? Please annotate the release point(s) on the site plan.</i>	n/a
21.4	<i>Where was the released AFFF or chemical discharged to? Please annotate the discharge point(s) on the site plan.</i>	n/a
22	<i>Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?</i>	possibly - unsure
23	<i>Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?</i>	unsure
24	<i>Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.</i>	none that i am aware of

Any other comments or notes.



MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF (*aqueous film-forming foam, firefighting foam*) occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Port Adelaide SAMFS Fire Station

Name:

Position when working at the site:

Fire fighter

Phone number:

Email:

Date of response:

20/6/22

U

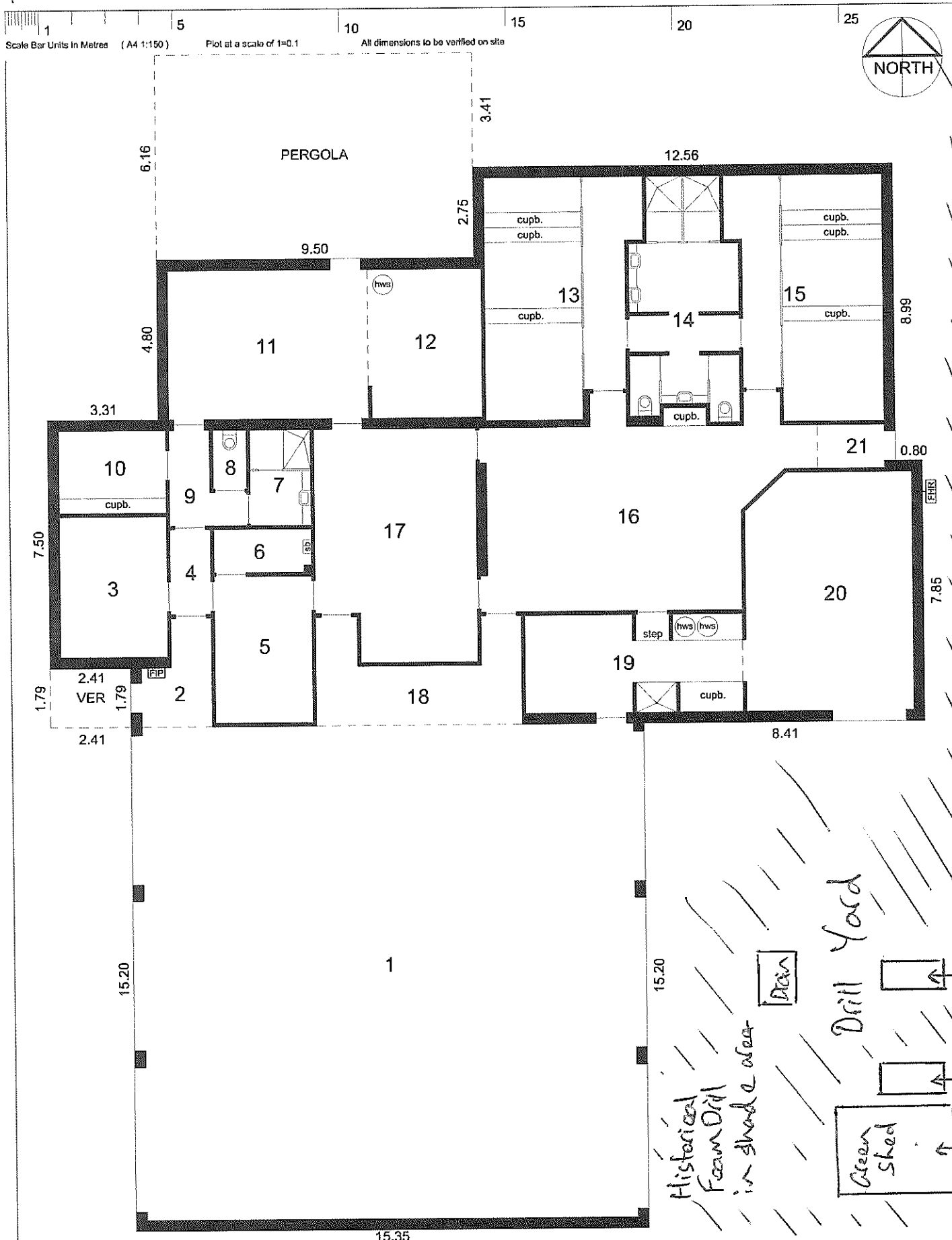
Item	Question	Response
1	When did you start working at this station?	1987
2	How long have you worked at this station?	30 years including relieving
3	Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?	Storm water pit
4	Can you describe any changes in how stormwater has been managed at the site over time?	None that I am aware of.
5	Is stormwater harvested within the site?	No.
5.1	If yes, please describe where and how stormwater is harvested.	—
5.2	For what purposes is stormwater harvested?	—
6	Are there groundwater wells / bores at the site?	No
6.1	If yes, for what purpose is groundwater used at the site?	Not applicable

Item	Question	Response
6.2	Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.	Not applicable
7	Date when AFFF was first used on site?	Early 80's
8	Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)	
9	Was AFFF used in regular training exercises? If so:	Yes
9.1	How often was the training? (e.g. weekly, monthly, quarterly)	Annually
9.2	Can you describe the location of the training areas and annotate them on the site plan?	
9.3	Can provide an estimate of how much AFFF was used in each training?	Up to 100 litres
9.4	Was the training ground sealed / open?	Open
9.5	Was AFFF dispersed aerially? If so, please indicate the maximum extent on the site plan?	
9.6	When was the date of the last training event that included the use of AFFF?	Mid 1990's
10	Please describe how the waste water was managed following training events? Specifically, was there a recycling system, storage pond, storage tanks or drains? Please annotate waste water discharge point / pathways on the site plan.	No recycling or storage at site.
11	Did any waste water flow into drains that directed the waste water off-site? Please annotate the waste water discharge points / pathways on the site plan.	Yes
12	Were there any changes how the waste water was managed over time? If so, please describe the changes.	None that I am aware of.
13	Is there any inventory of AFFF use for the site?	No.

Item	Question	Response
14	Can you estimate the total volume of AFFF used on site before it was phased out in 2016?	Unknown.
15	Where was AFFF stored on site? Please annotate the storage location on the site plan.	Yes
15.1	What type and size of storage containers were used to store AFFF on site?	200 litre drums. Metal later replaced by Plastic drums.
15.2	What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?	24 x 200 litre Drums
16	Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances. What equipment was used to transfer the AFFF?	Foam ~~eq~~ equipment such as large Foam Canon and and Inductor lines were stored in a trailer as per plan
17	How were spent drums of AFFF disposed of?	Unknown.
18	Were there any wash down areas for fire trucks, equipment or AFFF containers? If so:	Rear yard.
18.1	How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)	No recycling. Discharged to drains.
18.2	Were there any changes how the waste water was managed over? If so, please describe the changes.	None that I am aware of.
19	Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.	Underground diesel fuel storage tank Easter side of yard
20	Is there an incident log / register for the site?	Yes. Doesn't capture historical AFFF use.

Item	Question	Response
21	Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:	No
21.1	When did such release(s) happen?	Not applicable
21.2	What substance(s) was/were released?	N/A.
21.3	Where did such release(s) happen? Please annotate the release point(s) on the site plan.	—
21.4	Where was the released AFFF or chemical discharged to? Please annotate the discharge point(s) on the site plan.	In waste water to drains
22	Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?	Area behind green storage shed where foam was stored.
23	Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?	No.
24	Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.	None.

Any other comments or notes.



Asset Name **PORT ADELAIDE SAMFS**

Building Use **FIRE STATION**

Created by. Archink Drawn A Bentley Date Apr 2010

Modified by. - Drawn - Date -

Bldg area m² 611 Ver area m² 4 Plan ref. 7811-WD1



Government of South Australia

Department for Transport,
Energy and Infrastructure

Strategic Asset Management Information System Plan

SAMIS 09166-01-1

16000 L Diesel VST

6 incidents over 1 shift over 30 years used foam
→ wash out lines afterwards

- Cleanaway
- car fires (alloy blocks, 17g wheels)

Foam cannon → set and dripped next to storage shed
post learning use

- 150L AFFF instead of high-expansion foam 1 incident
150-120L Appliances → accidental release

- 1 incident AFFF instead of training foam
Knee deep blanket of foam

- regular appliance testing → release of small amounts
of foam

Appendix D

Borehole logs



BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH01

Page 1 of 1

Client MFS Project MFS Port Adelaide DSI Project No. 12616804 Site MFS Port Adelaide Location Grand Jct Rd Date Drilled 18/10/2023	Drill Co. WB Drilling Pty. Ltd. Driller WB Drilling Pty. Ltd. Rig Type Eziprobe Total Depth (m) 3.50 Diameter (mm) 50	Latitude -34.8530574934557 Longitude 138.505417518318 Grid Ref GDA94_MGA_zone_54 Elevation Logged By TW Checked By AR

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC					OTHER			PAVER	
0.2	PT		BH01_0.08-0.12			SAND fine to coarse, poorly graded, orange- brown (FILL)	SM	L		-0.2
0.4						Gravelly SAND fine to medium, poorly graded, tan, subangular, fine to medium, poorly graded gravel (FILL)	SM	L		-0.4
0.6						Sandy CLAY brown mottled orange- brown, with shells, fine to medium, poorly graded sand (NATURAL - SOIL)				-0.6
0.8										-0.8
1										-1
1.2										-1.2
1.4			BH01_1.4-1.5							-1.4
1.6						Sandy CLAY low to medium plasticity, dark brown to black, some shells, fine to medium, poorly graded sand (NATURAL - SOIL)	M	S		-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4						SAND fine to medium, poorly graded, dark grey to black, trace shells (NATURAL - SOIL)	M			-2.4
2.6						Sandy CLAY low to medium plasticity, pale grey, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	S		-2.6
2.8										-2.8
3										-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at: 3.50 m. Borehole collapse.				-3.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH02

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8529549408704
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505376782268
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Total Depth (m) 3.50	Elevation
Location Grand Jct Rd	Diameter (mm) 50	Logged By TW
Date Drilled 18/10/2023		Checked By AR

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC					OTHER			PAVER	
0.2	PT					SAND fine to coarse, poorly graded, orange- brown (FILL)	SM	L		-0.2
0.4			BH02_0.3-0.4			Gravelly SAND fine to medium, poorly graded, tan, subangular, fine to medium, poorly graded gravel (FILL)	SM	L		-0.4
0.6						Silty SAND fine to medium, poorly graded, dark brown (FILL)	SM	L	porcelain refuse, coal refuse	-0.6
0.8										-0.8
1						Sandy CLAY low to medium plasticity, brown with pale grey, some shells, fine to medium, poorly graded sand (NATURAL - SOIL)	M	F		-1
1.2										-1.2
1.4										-1.4
1.6						Sandy CLAY low to medium plasticity, dark grey, with shells, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	S		-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6			BH02_2.5-2.6							-2.6
2.8										-2.8
3						Sandy CLAY low to medium plasticity, pale grey, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	S		-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at: 3.50 m. Borehole collapse.				-3.6

Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH03

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8530294978991
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505295310169
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Total Depth (m) 3.50	Elevation
Location Grand Jct Rd	Diameter (mm) 50	Logged By TW
Date Drilled 18/10/2023		Checked By AR

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC					OTHER			PAVER	
0.2	PT		BH03_0.08-0.18 (FD03,FS03)			Gravelly SAND fine to medium, poorly graded, tan, subangular, fine to medium, poorly graded gravel (FILL)	SM	L		-0.2
0.4						SAND fine to medium, poorly graded, brown, with medium gravel (FILL)	SM	L		-0.4
0.6			BH03_0.6-0.7			WASTE pale grey (FILL)			CONCRETE	-0.6
0.8						Sandy CLAY low to medium plasticity, poorly graded, dark brown to black, fine to medium, poorly graded sand (NATURAL - SOIL)	SM	F	Possible ash	-0.8
1			BH03_0.9-1.0							-1
1.2										-1.2
1.4										-1.4
1.6						Sandy CLAY low to medium plasticity, dark grey to black, with shells, fine to medium, poorly graded sand (NATURAL - SOIL)	M	S		-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8										-2.8
3										-3
3.2						Sandy CLAY medium plasticity, pale grey, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	VS		-3.2
3.4										-3.4
3.6						Termination Depth at: 3.50 m. Borehole collapse.				-3.6

Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH04

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.852914204821
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505292963237
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Total Depth (m) 3.50	Elevation
Location Grand Jct Rd	Diameter (mm) 50	Logged By TW
Date Drilled 18/10/2023		Checked By AR

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC		BH04_PAVER			OTHER			PAVER	
0.2	PT		BH04_0.08-0.18 (FD04,FS04)			Gravelly SAND fine to medium, poorly graded, tan, subangular, fine to medium, poorly graded gravel (FILL)	SM	L		-0.2
0.4			BH04_0.2-0.3			Silty SAND fine to medium, poorly graded, brown (FILL)	SM	L		-0.4
0.6										-0.6
0.8						Sandy CLAY dark brown mottled orange- brown, trace shells, fine to medium, poorly graded sand (possible FILL)				-0.8
1										-1
1.2										-1.2
1.4										-1.4
1.6						Sandy CLAY low to medium plasticity, dark grey, with shells, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	S		-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8										-2.8
3			BH04_2.9-3.0			Sandy CLAY low to medium plasticity, pale grey, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	S		-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at: 3.50 m. Borehole collapse.				-3.6

Notes

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Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH05

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8529284540564
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505166145042
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Total Depth (m) 4.00	Elevation
Location Grand Jct Rd	Diameter (mm) 50	Logged By TW
Date Drilled 18/10/2023		Checked By AR

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC					OTHER			PAVER	
0.2	PT		BH05_0.08-0.12			SAND fine to coarse, poorly graded, orange- brown (FILL)	SM	L		-0.2
0.4						Gravelly SAND fine to medium, poorly graded, tan, subangular, fine to medium, poorly graded gravel (FILL)	SM	L		-0.4
0.6						SAND dark brown, trace fine to medium gravel (possible NATURAL - SOIL)				-0.6
0.8										-0.8
1			BH05_0.9-1.0							-1
1.2						Sandy CLAY medium plasticity, dark brown mottled orange- brown, trace fine gravel, fine to medium, poorly graded sand (NATURAL - SOIL)	SM	F		-1.2
1.4										-1.4
1.6										-1.6
1.8						SAND fine to coarse, poorly graded, grey- black, with shells, some (NATURAL - SOIL)				-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8										-2.8
3										-3
3.2										-3.2
3.4										-3.4
3.6						Sandy CLAY medium plasticity, pale grey, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	S		-3.6
3.8										-3.8
4						Termination Depth at: 4.00 m. Borehole collapse.				-4

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH06

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8528662603348
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505118368194
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Total Depth (m) 3.00	Elevation
Location Grand Jct Rd	Diameter (mm) 50	Logged By TW
Date Drilled 18/10/2023		Checked By AR

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC					OTHER			PAVER	
0.2	PT					SAND medium to coarse, poorly graded, orange-brown (FILL)	SM	L		-0.2
0.4			BH06_0.3-0.4			Gravelly SAND fine to medium, poorly graded, tan, subangular to subrounded, fine to medium, poorly graded gravel (FILL)	SM	L		-0.4
0.6						Sandy CLAY medium plasticity, grey mottled orange-brown, fine to medium, poorly graded sand (NATURAL - SOIL)	SM	F		-0.6
0.8										-0.8
1			BH06_1.0-1.1							-1
1.2						SAND fine to coarse, poorly graded, pale brown, with shells (NATURAL - SOIL)	M	L		-1.2
1.4										-1.4
1.6										-1.6
1.8						SAND fine to coarse, poorly graded, grey- black, with shells (NATURAL - SOIL)	VM	L		-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8										-2.8
3						Termination Depth at: 3.00 m. Borehole collapse.				-3

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH07

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8530239239335
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505106968805
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Total Depth (m) 3.50	Elevation
Location Grand Jct Rd	Diameter (mm) 50	Logged By TW
Date Drilled 18/10/2023		Checked By AR

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC					OTHER			PAVER	
0.2	PT					SAND fine to coarse, poorly graded, orange- brown (FILL)	SM	L		-0.2
0.4			BH07_0.35-0.45			Gravelly SAND fine to medium, poorly graded, tan, subangular, fine to medium, poorly graded gravel (FILL)	SM	L		-0.4
0.6						Sandy CLAY medium plasticity, dark brown, trace fine to medium gravel, trace shells, fine to medium, poorly graded sand (NATURAL - SOIL)	SM	F		-0.6
0.8										-0.8
1										-1
1.2										-1.2
1.4										-1.4
1.6						Sandy CLAY medium plasticity, orange- brown, trace shells, fine to medium, poorly graded sand (NATURAL - SOIL)	M	S		-1.6
1.8			BH07_1.8-1.9							-1.8
2						SAND fine to coarse, poorly graded, black- grey, trace shells (NATURAL - SOIL)	VM	L		-2
2.2										-2.2
2.4										-2.4
2.6										-2.6
2.8						Sandy CLAY medium plasticity, pale grey (NATURAL - SOIL)	VM	S		-2.8
3										-3
3.2										-3.2
3.4										-3.4
3.6						Termination Depth at: 3.50 m. Borehole collapse.				-3.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW01

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8530651209876
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505512401462
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Drill Method	Elevation
Location Grand Jct Rd	Total Depth (m) 4.00	Logged By TW
Date Drilled 19/10/2023	Casing Diameter (mm) 50	Checked By AR

B.C.L No. 449010 Casing 50 mm PVC (Class 18) Screen 0.5mm Slotted PVC (Class 18) Surface Completion Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
	DC						OTHER			Paver	
0.2	PT		MW01_0.08-0.18		Concrete/C		SAND medium, poorly graded, subangular, pale tan- brown, with fine to medium gravel, subangular, fine to medium, poorly graded gravel (FILL)	D	VL		-0.2
0.4					Bentonite		Clayey SAND fine to medium, poorly graded, platy, dark brown, trace rootlets (possible FILL)	D	L		-0.4
0.6							SAND fine, poorly graded, pale tan- brown (possible NATURAL - SOIL)	SM	L		-0.6
0.8											-0.8
1											-1
1.2							Sandy CLAY medium plasticity, dark brown, with shells (NATURAL - SOIL)	M	D		-1.2
1.4											-1.4
1.6											-1.6
1.8											-1.8
2							Sandy CLAY low to medium plasticity, dark brown- black, with shells (NATURAL - SOIL)	VM	D		-2
2.2											-2.2
2.4					Gravel Pack						-2.4
2.6											-2.6
2.8							Sandy CLAY low to medium plasticity, dark black- grey, trace (NATURAL - SOIL)	W	D		-2.8
3											-3
3.2											-3.2
3.4			MW01_3.4-3.5								-3.4
3.6	HFA										-3.6
3.8											-3.8
4							Termination Depth at: 4.00 m. Target depth achieved.				4

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW02

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8529373388737
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505053156987
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Drill Method	Elevation
Location Grand Jct Rd	Total Depth (m) 4.00	Logged By TW
Date Drilled 19/10/2023	Casing Diameter (mm) 50	Checked By AR

B.C.L No. 449009 Casing 50 mm PVC (Class 18) Screen 0.5mm Slotted PVC (Class 18) Surface Completion Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	DC PT		MW02_0.08-0.18 (FD05, FS05)		Concrete/C		OTHER	D	VL	Paver	-0.2
0.4					Bentonite		Gravelly SAND medium, poorly graded, subangular, pale tan- brown, with fine to medium gravel, subangular, fine to coarse, poorly graded gravel				-0.4
0.6							Sandy CLAY low to medium plasticity, dark black- brown, some fine gravel, subangular, fine to medium, poorly graded gravel (possible NATURAL - SOIL)	SM	MD		-0.6
0.8											-0.8
1											-1
1.2											-1.2
1.4			MW02_1.3-1.4								-1.4
1.6											-1.6
1.8							Sandy CLAY low to medium plasticity, dark black- brown, with shells (NATURAL - SOIL)	VM	MD		-1.8
2											-2
2.2											-2.2
2.4					Gravel Pack						-2.4
2.6											-2.6
2.8			MW02_2.7-2.8								-2.8
3							Sandy CLAY low plasticity, dark (NATURAL - SOIL)	S	MD		-3
3.2											-3.2
3.4											-3.4
3.6	HFA										-3.6
3.8											-3.8
4							Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard



BOREHOLE LOG

MONITORING WELL MW03

ENVIRONMENTAL-GROUNDWATER

Page 1 of 1

Client MFS	Drill Co. WB Drilling Pty. Ltd.	Latitude -34.8531274823472
Project MFS Port Adelaide DSI	Driller WB Drilling Pty. Ltd.	Longitude 138.505849521607
Project No. 12616804	Rig Type Eziprobe	Grid Ref GDA94_MGA_zone_54
Site MFS Port Adelaide	Drill Method	Elevation
Location Grand Jct Rd	Total Depth (m) 4.00	Logged By TW
Date Drilled 19/10/2023	Casing Diameter (mm) 50	Checked By AR

B.C.L No. 449008 Casing 50 mm PVC (Class 18) Screen 0.5mm Slotted PVC (Class 18) Surface Completion Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Elevation (m)
0.2	DC PT				Concrete/G		OTHER	SM	L	PAVER	-0.2
0.4					Bentonite		SAND fine to coarse, poorly graded, orange- brown (FILL) Gravelly SAND fine to medium, poorly graded, tan, subangular, fine to medium, poorly graded gravel (FILL) Sandy CLAY brown mottled orange- brown, trace fine to medium gravel (possible NATURAL - SOIL)	SM	L		-0.4
0.6											-0.6
0.8											-0.8
1											-1
1.2							Sandy CLAY low to medium plasticity, dark brown, with shells, fine to medium, poorly graded sand (NATURAL - SOIL)	M	S		-1.2
1.4											-1.4
1.6											-1.6
1.8			MW03_1.8-1.9								-1.8
2							Sandy CLAY low to medium plasticity, dark grey to black, some shells (NATURAL - SOIL)	M	S		-2
2.2											-2.2
2.4					Gravel Pack						-2.4
2.6											-2.6
2.8											-2.8
3											-3
3.2							Sandy CLAY low to medium plasticity, grey, fine to medium, poorly graded sand (NATURAL - SOIL)	VM	S		-3.2
3.4			MW03_3.4-3.5								-3.4
3.6	HFA										-3.6
3.8											-3.8
4							Termination Depth at: 4.00 m. Target depth achieved.				-4

Notes

This log is not intended for geotechnical purposes. Hollow triangle symbolises water strike, solid triangle symbolises recovered water level.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, MR-Mud Rotary, NDD-Non Destructive Drilling, PT-Pushtube, RB-Rotary Blade, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense, VD - Very Dense Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix E

SSHILs Methodology

Our ref: 12602101

28 June 2023

Krystle Mitchell
Senior Scientific and Environment Officer
South Australian Metropolitan Fire Service
99 Wakefield Street
Adelaide, SA 5000

Derivation of site-specific health investigation levels for urban and regional fire stations – South Australia Metropolitan Fire Service (SA MFS)

Dear Krystle,

1. Introduction

This letter describes the derivation of site-specific health investigation levels (SSHILs) for per- and poly-fluoroalkyl substance (PFAS) contaminated soil at fire stations operated by the South Australia Metropolitan Fire Service (SA MFS). SSHILs have been derived for urban and regional settings based on the methodology provided in the following documents:

- Heads of EPAs Australia and New Zealand (HEPA) and the Australian Government Department of the Environment and Energy (DoEE) – *PFAS National Environmental Management Plan* (the 'PFAS NEMP') (HEPA, 2020)
- National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013) (the 'ASC NEPM')
- NSW and Office of Environment and Heritage (OEH, 2019) *Human health soil screening criteria for PFOS, PFHxS and PFOA*

1.1 Background

From 2007, SA MFS began phasing out the use of aqueous film-forming foam (AFFF) containing perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) as key constituents, due to concerns regarding the hazards posed by these compounds to human health and the environment. The SA MFS replaced all firefighting foam in 2016 to ensure that only fluorine-free foam was in use. Currently, state-wide, all SA MFS appliances carry firefighting foams that do not contain PFOS or PFOA and are fluorine-free. During 2017/2018, the SA MFS also removed all fire extinguishers containing PFAS. In 2018, SA MFS engaged GHD to provide ongoing environmental services and undertake site contamination assessments across many of their operational sites as well as risk profiling for their entire portfolio of sites to effectively manage the potential for PFAS contamination and any associated human health and ecological risks.

The PFAS NEMP provides generic health investigation levels (HILs) for PFOS, PFOA and perfluorohexane sulfonate (PFHxS) in soil in four land use settings, as summarised in Table 1 below. The land use settings considered in the PFAS NEMP are consistent with those that underpin the HILs presented for a variety of contaminants within the ASC NEPM. The derivation of the PFAS HIL values is described in detail by OEH (2019).

Table 1 Summary of exposure scenarios adopted to derive generic HILs.

Land use	HIL (mg/kg)	Exposure scenario description
HIL A Residential, with gardens /accessible soil	PFOS+PFHxS: 0.01 PFOA: 0.1	- Low-density residential settings with sizeable gardens and with areas of soil that are accessible - Gardens are assumed to consist of lawns, garden beds and small vegetable gardens and areas of fruit trees - Assumes home-grown produce provides up to 10% of fruit and vegetable intake (does not account for consumption of eggs from home poultry) - Site users are adults, children and infants who spend most of their time at home and use the outdoor areas of the residences on a frequent basis for activities such as gardening or recreation. This scenario assumes 20 hours a day spent indoors and 4 hours a day spent outdoors in direct contact with soil. - Children are the most sensitive human receptors. This scenario is protective of childcare centres, kindergartens, preschools and primary schools and their integral playgrounds.
HIL B Residential, with minimal opportunities for soil access	PFOS+PFHxS: 2 PFOA: 20	- High-density residential settings, such as unit blocks, where communal outdoor spaces are largely covered by permanent paving and with some small areas of landscaping or lawns - Assumes that there are minimal opportunities for direct access to soil by residents. There may be some potential for residents to inhale, ingest or come into direct dermal contact with dust particulates derived from the on-site soil. - Assumes no use of soil to produce vegetables, fruit or poultry - Site users are adults, children and infants who spend most of their time indoors with limited use of communal outdoor areas on site. This scenario assumes 20 hours a day spent indoors and 1 hour a day spent outdoors in direct contact with soil. - Children are the most sensitive human receptors
HIL C Public open space	PFOS+PFHxS: 1 PFOA: 10	- Parks, playgrounds, recreational areas and playing fields that are fully accessible to the public - These areas may contain lawns, gardens, vegetated areas, and walkways with some areas of exposed soil - Assumes no use of soil to produce vegetables, fruit or poultry - Site users are adults and children who may use the area for up to 2 hours a day, 7 days a week - Children are the most sensitive human receptors
HIL D Commercial/ industrial	PFOS+PFHxS: 20 PFOA: 50	- Commercial and/or industrial settings where the outdoor areas are largely (80%) covered by hardstand, possibly with some limited areas of landscaping or lawns - Site users are adult employees that spend up to 8 hours a day indoors and 1 hour a day outdoors for up to 240 days per year - There are minimal opportunities for direct access to soil. There is the potential for employees to inhale, ingest or come into direct contact with dust particulates derived from the soil on the site.

A review of Table 1 indicates that the typical usage patterns at SA MFS fire stations most closely align with the exposure assumptions that underpin the HIL D values. The following inconsistencies are however noted:

- The preliminary site investigations undertaken at SA MFS sites across South Australia has identified that some fire stations have a higher proportion of unsealed ground (up to approximately 75% of the total site area) than has been assumed in the derivation of the HIL D values (up to approximately 20% of the total site area). As a result of this, there may be greater opportunities for direct access to soil at SA MFS fire stations, including the ingestion of soil and soil-derived dust.
- The shifts worked by SA MFS firefighters do not align with the assumption of a standard working week than underpins the HIL D values

Given these factors, SSHILs have been derived using exposure assumptions that reflect the typical usage pattern of the SA MFS fire stations, to allow for a more accurate assessment of the health risks that may be associated with the presence of PFAS in shallow soils.

1.2 Objective of this report

The objective of this report is to derive SSHILs for PFOS+PFHxS and PFOA in soils that are protective of workers at SA MFS fire stations in typical urban and regional settings. The purpose of these SSHILs is to facilitate the screening assessment of soil datasets for human health risks.

2. Derivation methodology

The SSHILs have been calculated using the HILs spreadsheet (Excel format) provided on the ASC NEPM website¹. The algorithms underlying the HILs spreadsheet are detailed in Schedule B7 of the ASC NEPM. These algorithms were also used in the derivation of the HILs PFOS+PFHxS and PFOA, presented in Table 1 and as detailed by OEH (2019).

The process used to derive the SSHILs involved the following key steps:

- **Toxicity assessment:** which established the relationships between PFAS exposure and potential health and ecological effects, using published toxicological information
- **Exposure assessment:** which produced estimates of the PFAS exposure that may be experienced by users of SA MFS fire stations.
- **Risk characterisation:** which combines the results of the toxicity assessment and exposure assessment, to derive soil criteria that are protective of potential risks to the health of users of SA MFS fire stations.

The toxicity assessment and exposure assessment inputs used in the derivation of the SSHILs are detailed herein, with the SSHILs provided in Section 3.

2.1 Toxicity assessment methodology

A toxicity assessment determines whether human exposure to a chemical could cause an increase in the incidence of an adverse health condition (NEPC, 2013). The outcomes of the toxicity assessment process are a set of toxicity criteria that have been used to derive the SSHILs.

For most chemicals there is a dose below which no adverse health effect will occur (i.e., a threshold toxicant). PFAS have been linked with several threshold toxicities, including effects on cholesterol and immunotoxicity. Accordingly, the SSHILs focus on potential threshold risks linked to PFAS exposure. Chronic health risks for threshold chemicals are assessed by comparing the estimated intake with toxicity reference values (TRVs), which are a measure of tolerable daily exposure. The TRVs adopted in the derivation of the SSHILs are consistent with those that underpin the HIL D values presented in the PFAS NEMP, as detailed in Table 2.

The toxicity assessment process also considers the toxicokinetics of PFAS and in particular the tendency of PFAS to be absorbed via the various potential routes of exposure (i.e., ingestion, inhalation and dermal absorption). Consistent with the approach adopted by OEH (2019) the dermal uptake of PFAS has been assumed to be negligible and has not been included in the derivation of the SSHILs.

¹ <https://www.nepc.gov.au/nepms/assessment-site-contamination/toolbox>

Table 2 Summary of toxicological input parameters used in the derivation of the SSHILs.

Chemical	Toxicity assessment input parameters	Source
Toxicity reference values		
PFOS, PFHxS (sum)	20 ng/kg/day	OEH (2019); FSANZ (2017)
PFOA	160 ng/kg/day	OEH (2019); FSANZ (2017)
Absorption parameters		
Dermal absorption	Negligible	OEH (2019)
Gastrointestinal absorption	100%	OEH (2019); FSANZ (2017)

2.2 Exposure assessment methodology

In an exposure assessment, appropriate exposure assumptions are identified for each exposure pathway, and these are used in conjunction with exposure modelling algorithms to estimate intakes of contaminants by the exposed receptors (NEPC, 2013).

The exposure assessment inputs adopted in the derivation of the SSHILs have primarily been sourced from OEH (2019), with adjustments made as appropriate, based on information provided by SA MFS. A summary of the adopted exposure assessment inputs and the rational underpinning the selected values is provided in Attachment 1. These inputs can be summarised as follows:

- *Firefighter physiology*: The ASC NEPM Schedule B7 provides standard exposure parameters for commercial / industrial scenarios, including factors such as the body weight and inhalation characteristics of adult workers. Consistent with the approach adopted by OEH (2019), these have been adopted in the derivation of SSHILs, as SA MFS firefighters will typically be physiologically consistent with the general population.
- *Exposure frequency and time onsite*: Information provided by SA MFS has been used to select appropriate input assumptions around exposure frequency and time spent onsite, as detailed in Section 2.2.1
- *Exposure to PFAS from external sources*: PFAS is present in a variety of domestic products and commercial applications and is ubiquitous in urban settings. Hence, SA MFS firefighters are likely to be exposed to PFAS from a variety of sources external to the fire stations, such as food, air, water and consumer products. The TRVs detailed in Section 2.1 are relevant to the PFAS intake from all sources. The HIL D presented in the PFAS NEMP were derived based on the conservative assumption that 80% of the exposure to PFAS experienced by workers originates from external sources, with 20% of the TRV allocated to PFAS in fire station soils. This conservative assumption has been retained in the derivation of SSHILs for SA MFS firefighters
- *Incidental soil ingestion rates*: The incidental soil ingestion rates for SA MFS firefighters have been assumed to be consistent with those experienced by adults in a residential setting (50 mg/day), rather than those adopted in the ASC NEPM and by OEH (2019) for commercial/industrial sites (25 mg/day). This approach is likely to be conservative but has been adopted to account for the extended shifts worked by firefighters in metropolitan areas and the substantial areas of unsealed ground that are present on some of the SA MFS fire stations.
- *Use of SA MFS fire stations by children*: Children have not been specifically included in the derivation of the SSHILs. It is understood that children do visit the SA MFS fire stations but that this does not occur with regularity. Hence, the SSHILs, which have been derived to be protective of firefighters employed at the fire stations, will also be adequately protective of the health children visiting less frequently.

- *Produce production and consumption*: Historically, produce gardens were present on a number of the SA MFS fire stations and it is understood that there was some concern that the time spent tending these gardens and consuming produce would be associated with increased levels of exposure to PFAS. In 2022 however, SA MFS issued a directive on advice from GHD and EPA that all fruit and vegetable plants be removed from fire stations and replaced with ornamental plants (refer to Attachment 2). Areas of ornamental landscaping are not inconsistent with the exposure assumptions underpinning the HIL D values and therefore adjustments to the exposure assumptions used to derive the SSHILs have not been made on this basis.

2.2.1 Firefighter shifts

As noted in Table 1, the generic HIL D values assume that workers spend up to 240 days a year at commercial/industrial sites: eight hours a day indoors and one hour a day outdoors. This is equivalent to a total yearly exposure of 2160 hours. Given that the shifts worked by firefighter in both urban and regional areas differ from this pattern, the specific exposure times provided by SA MFS have been adopted in the derivation of the SSHILs as follows:

- Metropolitan fire stations – SA MFS has indicated that firefighters typically work two 10-hour dayshifts and two 14-hours nightshifts followed by four days off work and that firefighters work for 6 months before taking 6 weeks of annual leave. This averages to 12-hour shifts for circa 150 days per year. This is equivalent to a total yearly exposure of 1800 hours, which is lower than the exposure assumption underpinning the generic HIL D values.
- Regional fire stations – SA MFS has indicated that firefighters can spend up to three hours a week at regional fire stations. This is equivalent to a total yearly exposure of 156 hours per year, which is substantially lower than the exposure assumption underpinning the generic HIL D.

3. Site-specific HILs for the screening of PFAS contaminated soils at SA MFS sites

The input parameters selected via the toxicity assessment and exposure assessment processes, as detailed in Sections 2.1 and 2.2 respectively, have been combined to calculate SSHILs for the screening of PFAS contaminated soils at SA MFS fire stations. The models used to calculate the SSHILs are presented in Attachment 3 and Table 3 summarises the derived SSHIL values.

Table 3 SSHILs derived for the screening of PFAS contaminated soil in urban and regional SA MFS fire stations

Fire station type	PFOS+PFHxS	PFOA*	Comment
Metropolitan	14 mg/kg	50 mg/kg	These SSHILs assumes four 12-hour shifts every eight days (i.e., four days at work and four days off)
Regional	40 mg/kg	50 mg/kg	These SSHILs assumes one 3-hour shift per week.
Notes: Although higher values were calculated using the toxicity and exposure assessment process, the SSHIL for PFOA has been set as 50 mg/kg in anticipation of the Stockholm Convention low content limit. This is consistent with the PFAS NEMP			

4. Closure

We trust that the information above is sufficient for SA MFS's purposes. Should you have any further questions on this document please do not hesitate to contact the undersigned.

Regards



Davide Menozzi
Senior Environmental Scientist
davide.menozzi@ghd.com



Ben Petticrew
Technical Director
ben.petticrew@ghd.com

5. References

- FSANZ. (2017). *Food Standards Australia New Zealand's (FSANZ) report on Perfluorinated Chemicals in Food*.
- HEPA. (2020). *PFAS National Environmental Management Plan - Version 2.0*.
- NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Amendment Measure*.
- OEH. (2019). *Human health soil screening criteria for PFOS, PFHxS and PFOA*.

Attachments

Attachment 1

**Summary of exposure assessment
inputs**

Summary of SA MFS sites - unsealed areas

Location (metro)	Unsealed area (m^2)	Total area (m^2)	% unsealed
Angle park	111254	153034	73%
Adelaide	115	20000	1%
St Marys	1229	4543	27%
Largs	1163	3316	35%
Woodville	141	2172	6%
Christie Downs	710	2321	31%
Camden Park	531	2771	19%
Oakden	1302	4802	27%
Port Adelaide	449	4349	10%
O'Halloran Hill	2959	7300	41%
Brooklyn Park	1090	3710	29%
Beulah Park	335	2791	12%
Elizabeth	100	3256	3%
Gawler	1300	3457	38%
Glen Osmond	180	3152	6%
Golden Grove	1172	3994	29%
Paradise	680	4090	17%
Prospect	580	2820	21%
Salisbury	2442	12607	19%
Seaford	2300	7450	31%
Mount Barker	362	2110	17%
	Unsealed Average	Total Area Average	% average
	815	4,913	17%
Max	111254	153034	73%
Min	100	2110	1%

Location (regional)	Unsealed area (m^2)	Total area (m^2)	% unsealed
Loxton	987	2154	46%
Moonta	1	920	0%
Whyalla	6224	11054	56%
Mt Gambier	1506	3884	39%
Kapunda	1	395	0%
Peterborough	519	994	52%
Port Pirie	7875	19297	41%
Port Augusta	961	2461	39%
Murray Bridge	796	2005	40%
Berri	583	3065	19%
Kadina	1	577	0%
Port Lincoln	420	6058	7%
Renmark	70	3573	2%
Tanunda	168	1438	12%
Victor Harbor	400	1847	22%
Walleroo	1032	1600	65%
	Unsealed Average	Total Area Average	% average
	222	2,276	10%
Max	7875	19297	65%
Min	1	395	0%

Summary of exposure parameters

Summary of Exposure Parameters	units	Parameter			Rationale
		HIL D	SA MFS SSHIL - Urban	SA MFS SSHIL - Regional	
Soil and Dust Ingestion Rate	mg/day	25	50	50	HIL D assumes that the incidental soil ingestion rate experienced by adults working for 8-hours on a commercial industrial site (25 mg/day) is likely to be ~50% of that experienced by adults in a residential setting (50 mg/day), given that waking hours are typically ~16-hours per day. The ASC NEPM residential soil ingestion rate has been adopted for SA MFS firefighters, given that substantial areas of unsealed ground are present on some of the SA MFS fire stations and firefighters may spend significant periods of time outdoors. This assumption is likely to be conservative for firefighters in regional settings, who typically spend less time onsite
Time Spent Outdoors	hours	1	4	2	HIL D assumes a standard 8-hour working day, with minimal time spent outdoors. MFS SA has indicated that:
Time Spent Indoors	hours	8	8	1	- firefighters in metropolitan locations typically work 12-hour shifts - firefighters in regional locations typically work 3-hour shifts It has also been assumed that firefighters may spend significant amounts of time outdoors, undertaking activities such as training and equipment and facility maintenance
Lung Retention Factor	-	0.375	0.375	0.375	ASC NEPM default, as detailed in Schedule B7. Describes the percentage of dust that is small enough to be inhaled.
Particulate Emission Factor	(m ³ /kg)	3.70E+10	9.7E+09	9.7E+09	Calculated as described in Schedule B7 of the ASC NEPM. For HIL D, up to 20% of the site is assumed to be open ground. For the SA MFS fire stations up to 75% of the site is assumed to be open ground
Indoor Air Dust Factor	(m ³ /kg)	2.6E+07	2.6E+07	2.6E+07	ASC NEPM default, as described in Schedule B7. The indoor dust concentration is assumed to be equal to the 95th percentile from Australian data (enHealth 2012; 39 µg/m ³), noting that indoor air can be enriched with dust compared to the outdoor environment, due to the movement of dust indoors on clothing, footwear etc.
Fraction of indoor dust comprised of outdoor soil	-	0.5	0.5	0.5	ASC NEPM default, as described in Schedule B7. Assume 50% of indoor dust is comprised of soil tracked into the building
Body weight	kg	70	70	70	ASC NEPM default, as described in Schedule B7.
Exposure Frequency	days/year	240	140	52	HIL D assumes a 5-day working week for 48 weeks per year. MFS has indicated that - firefighters in metropolitan stations typically work four shifts every eight days - firefighters in regional stations typically work one 3-hour shift per week
Exposure Duration	years	30	30	30	ASC NEPM default, as described in Schedule B7. Note that this parameter does not influence the derived HIL for threshold chemicals, as exposure is averaged over the exposure duration.
Averaging Time (ingestion)	days	10950	10950	10950	Calculated based on the exposure duration. Multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (inhalation)	hours	262800	262800	262800	

Attachment 2

**SA MFS directive on the removal of
produce**

29 September 2022

FRUIT AND VEGETABLE GARDEN REMOVAL FROM ALL MFS STATIONS

MFS is directing all MFS stations to remove all fruit and vegetable gardens from MFS stations.

This is required to be completed by the **31st of October 2022**.

Garden waste can be disposed of as per the normal station procedures to dispose of this sort of waste. Where this is not practicable due to volume, please contact your Commander to arrange for an alternative solution, such as the provision of the high sided/skip pod.

If the fruit and vegetable garden cannot be removed by station personnel, please advise via the mfspfas@sa.gov.au. That email is to contain an audit of all fruit/vegetable trees that require removal by external contractors prior to 21 October 2022. The MFS will then arrange for these to be removed.

All fruit and vegetable gardens are required to be removed as the EPA see the presence of fruit and vegetable trees on fire stations as a possible human receptor to PFAS (even if you are not consuming the fruit and vegetables from them).

The MFS will provide ornamental plants and vegetation to replace the plants pulled out up to a value of \$100 on application. Applications from each station can be sent to mfspfas@sa.gov.au. Approval will then be forwarded to the relevant Metropolitan/Regional Commander to use their credit card to purchase the goods.

Metropolitan and Regional Commanders are to ensure that there are no fruit and vegetable gardens remaining at their relevant stations after the 31st of October 2022.

C Shift is responsible under the Station Management System - Station Administration, to ensure that this document is read, signed, placed on the Notice Board and filed.

Staff are reminded that the current SAPs, SOPs, Policies, SP Forms, Memorandums, Service Directives and Operational Procedures are available on the Members Only Website (MOW). This is a directive from the Chief Officer.

SIGNED

M. Morgan
**CHIEF OFFICER and
CHIEF EXECUTIVE**

ACTION	DATE	SIGN
Instruction received at Station		
Instruction read to "A" Shift		
Instruction read to "B" Shift		
Instruction read to "C" Shift		
Instruction read to "D" Shift		
Instruction read to Retained Staff		
Instruction read to OTR		
Placed on Notice Board		
Filed in Station File		

Attachment 3

SSHILs modelling inputs and outputs.

Derivation of Site specific health investigation levels

Firefighters at regional fire stations - South Australian Metropolitan Fire Service

Summary of Exposure Parameters			References/Notes	
Compound	Parameter	units	Abbreviation	
Soil and Dust Ingestion Rate	50	mg/day	IR _{So}	Site-specific assumption: Consistent with assumption adopted for adults in residential settings
Time Spent Outdoors	1	hours	ET _O	Site-specific assumption; 3-hour shifts during which 1 hour is spent outdoors.
Time Spent Indoors	2	hours	ET _I	Site-specific assumption; 3-hour shifts during which 2 hours are spent indoors.
Lung Retention Factor	0.375	-	RF	ASC NEPM default assumption
Particulate Emission Factor	9.7E+09	(m ³ /kg)	PEF _O	Calculated: Based on the site-specific assumption that up to 75% of individual sites is open ground
Indoor Air Dust Factor	2.6E+07	(m ³ /kg)	PEF _I	ASC NEPM default assumption
Fraction of indoor dust comprised of outdoor soil	0.5	-	TF	ASC NEPM default
Body weight	70	kg	BW _c	ASC NEPM default
Exposure Frequency	52	days/year	EF	Site-specific assumption: One shift per week
Exposure Duration	30	years	ED _c	ASC NEPM default assumption
Averaging Time (non-carcinogenic)	ED*365	days	AT _T	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations – Adult Worker											
Compound	Toxicity Reference Value Oral (TRV _o) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV _d) (mg/kg/day)	Oral Bioavailability BA _o (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI _o) (% of TDI)	Toxicity Reference Value Inhalation (TRV _i) (mg/m ³)	Background Intake Inhalation (BI _i) (% of TC)	Pathway Specific HILs (mg/kg)		Derived Soil HIL (not rounded) (mg/kg)
									Soil Ingestion	Dust	
PFOS+PFHXS	0.00002	1	0.00002	100%	-	80%	0.00007	0%	3.9E+01	NA	39
PFOA	0.00016	1	0.00016	100%	-	80%	0.00056	0%	3.1E+02	NA	314
NA									Pathway not of significance for chemical assessed		

Derivation of Site specific health investigation levels
Fire fighters at metropolitan fire stations - South Australian Metropolitan Fire Service

Summary of Exposure Parameters			References/Notes	
Soil and Dust Ingestion Rate	- Adults		Parameter	
Time Spent Outdoors	IR _{SA}	mg/day	50	Site-specific assumption: Consistent with assumption adopted for adults in residential settings
Time Spent Indoors	ET _o	hours	4	Site-specific assumption: 12-hour shifts during which 4 hours are spent outdoors.
Lung Retention Factor	ET _i	hours	8	Site-specific assumption: 12-hour shifts during which 8 hours are spent indoors.
Particulate Emission Factor	RF	-	0.375	ASC NEPM default assumption
Indoor Air Dust Factor	PEF _o	(m ³ /kg)	9.7E+09	Calculated: Based on the site-specific assumption that up to 75% of individual sites is open ground
Fraction of indoor dust comprised of outdoor soil	PEFI	(m ³ /kg)	2.6E+07	ASC NEPM default assumption
Body weight	TF	-	0.5	ASC NEPM default
Exposure Frequency	BW _c	kg	70	ASC NEPM default
Exposure Duration	EF	days/year	146	Site-specific assumption: Four shifts every eight days (i.e., four days at work and four days off)
Averaging Time (non-carcinogenic)	ED _c	years	30	ASC NEPM default assumption
	AT _T	days	ED*365	Calculated based on ED, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Adult Worker												
Compound	Toxicity Reference Value Oral (TRV _o) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV _d) (mg/kg/day)	Oral Bioavailability BA _o (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI _o) (% of TDI)	Toxicity Reference Value Inhalation (TRV _i) (mg/m ³)	Background Intake Inhalation (BI _i) (% of TC)	Pathway Specific HILs (mg/kg)			Derived Soil HIL (not rounded) (mg/kg)
									Soil Ingestion	Dermal	Dust	
PFOA+PFHxS	0.00002	1	0.00002	100%	-	80%	0.00007	0%	1.4E+01	NA	7.2E+04	14
PFOA	0.00016	1	0.00016	100%	-	80%	0.00056	0%	1.1E+02	NA	5.7E+05	112
NA												

Appendix F

Laboratory Reports



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

FREIGHT

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☒ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	ALS QUOTE:	COC SEQUENCE NUMBER (Circle)	Custody Seal intact?	Yes No N/A
PROJECT: MFS PORT ADELAIDE DSI	ORDER NO.: 12616804	COC: 1 2 3 4 5 6 7	Free ice / frozen ice bricks present upon receipt?	Yes No N/A
PROJECT MANAGER: Angus Robinson	CONTACT PH: 0431 177 498	OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	°C
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey)	SAMPLER MOBILE: 0467 034 756	RELINQUISHED BY: Terrence Wilson	RECEIVED BY: Kieren Burns	RECEIVED BY: <i>[Signature]</i>
COC emailed to ALS? YES	EDD FORMAT (or default): Esdat	DATE/TIME: 19 October 2023; 15:00	DATE/TIME: 19 October 2023; 15:00	DATE/TIME: 20/10/23
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHDLabReports@ghd.com		Other comment:		
Email Invoice to: Angus.Robinson@ghd.com; accountspayableAU@ghd.com				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH01_PAVR	18/10/2023	S	P	1		X						
2	BH01_0.08-0.12	18/10/2023	S	P	1	X							
3	BH01_0.3-0.4	18/10/2023	S	P	1		X						
4	BH01_0.9-1.0	18/10/2023	S	P	1		X						
5	BH01_1.4-1.5	18/10/2023	S	P	1	X							
6	BH01_2.2-2.3	18/10/2023	S	P	1		X						
7	BH01_2.4-2.5	18/10/2023	S	P	1		X						
8	BH01_2.9-3.0	18/10/2023	S	P	1		X						
9	BH01_3.4-3.5	18/10/2023	S	P	1		X						
10	BH02_PAVR	18/10/2023	S	P	1		X						
11	BH02_0.08-0.12	18/10/2023	S	P	1		X						
12	BH02_0.3-0.4	18/10/2023	S	P	1	X							
TOTAL					12								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division
Melbourne
Work Order Reference
EM2319006



Telephone : + 61-3-8549 9600

		CHAIN OF CUSTODY ALS Laboratory: please tick →												
CLIENT: GHD OFFICE: Adelaide		TURNAROUND REQUIREMENTS : ☒ Standard TAT (List due date): (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):												
PROJECT: MFS PORT ADELAIDE DSI		ALS QUOTE: ORDER NO.: 12616804												
PROJECT MANAGER: Angus Robinson CONTACT PH: 0431 177 498		COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 QF: 1 2 3 4 5 6 7												
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey) SAMPLER MOBILE: 0467 034 756		FOR 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 comment:												
COC emailed to ALS? YES EDD FORMAT (or default): Esdat		RELINQUISHED BY: Terrence Wilson RECEIVED BY: Kieren Burns DATE/TIME: 19 October 2023; 15:00 DATE/TIME: 19 October 2023; 15:00												
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHDLabReports@ghd.com Email Invoice to: Angus.Robinson@ghd.com; accountspayableAU@ghd.com		RECEIVED BY: <i>[Signature]</i> DATE/TIME:												
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:														
ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION	ANALYSIS REQUIRED including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
13	BH02_0.75-0.85	18/10/2023	S	P	1		X							
14	BH02_1.5-1.6	18/10/2023	S	P	1		X							
15	BH02_2.5-2.6	18/10/2023	S	P	1	X								
16	BH02_2.9-3.0	18/10/2023	S	P	1		X							
17	BH02_3.4-3.5	18/10/2023	S	P	1		X							
18	BH03_PAVAR	18/10/2023	S	P	1		X							
19	BH03_0.08-0.18	18/10/2023	S	P	1	X								
20	BH03_0.3-0.4	18/10/2023	S	P	1		X							
21	BH03_0.6-0.7	18/10/2023	S	P	1	X								
22	BH03_0.7-0.75	18/10/2023	S	P	1		X							
23	BH03_0.9-1.0	18/10/2023	S	P	1	X								
24	BH03_1.5-1.6	18/10/2023	S	P	1		X							
TOTAL					12									
Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solids; B = Unpreserved Bag.														



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS : ☒ Standard TAT (List due date): (Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	ALS QUOTE:		Custody Seal Intact? Yes No N/A	
PROJECT: MFS PORT ADELAIDE DSI	ORDER NO.: 12616804		Free ice / frozen ice bricks present upon receipt? Yes No N/A	
PROJECT MANAGER: Angus Robinson	CONTACT PH: 0431 177 498	COC SEQUENCE NUMBER (Circle)		Random Sample Temperature on Receipt: °C
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey)	SAMPLER MOBILE: 0467 034 756	COC: 1 2 3 4 5 6 7		Other comment:
COC emailed to ALS? YES	EDD FORMAT (or default): Esdat	RELINQUISHED BY: Terrence Wilson	RECEIVED BY: Kieren Burns	RECEIVED BY:
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHDLabReports@ghd.com		DATE/TIME: 19 October 2023; 15:00	DATE/TIME: 19 October 2023; 15:00	DATE/TIME:
Email Invoice to: Angus.Robinson@ghd.com; accountspayableAU@ghd.com				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
25	BH03_2.5-2.6	18/10/2023	S	P	1		X							
26	BH03_3.0-3.1	18/10/2023	S	P	1		X							
27	BH03_3.4-3.5	18/10/2023	S	P	1		X							
28	BH04_PAVAR	18/10/2023	S	P	1	X								
29	BH04_0.08-0.18	18/10/2023	S	P	1	X								
30	BH04_0.2-0.3	18/10/2023	S	P	1	X								
31	BH04_0.6-0.7	18/10/2023	S	P	1		X							
32	BH04_1.4-1.5	18/10/2023	S	P	1		X							
33	BH04_2.4-2.5	18/10/2023	S	P	1		X							
34	BH04_2.9-3.0	18/10/2023	S	P	1	X								
35	BH04_3.4-3.5	18/10/2023	S	P	1		X							
36	BH05_PAVAR	18/10/2023	S	P	1		X							
TOTAL					12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☒ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	ALS QUOTE:	COC SEQUENCE NUMBER (Circle)	Custody Seal intact?	Yes No N/A
PROJECT: MFS PORT ADELAIDE DSI	ORDER NO.: 12616804	COC: 1 2 3 4 5 6 7	Free ice / frozen ice bricks present upon receipt?	Yes No N/A
PROJECT MANAGER: Angus Robinson	CONTACT PH: 0431 177 498	OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	°C
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey)	SAMPLER MOBILE: 0467 034 756	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:
COC emailed to ALS? YES	EDD FORMAT (or default): Esdat	Terrence Wilson	Kieren Burns	
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHDLabReports@ghd.com		DATE/TIME: 19 October 2023; 15:00	DATE/TIME: 19 October 2023; 15:00	DATE/TIME:
Email Invoice to: Angus.Robinson@ghd.com; accountspayableAU@ghd.com				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	BH05_0.08-0.12	18/10/2023	S	P	1	X								
38	BH05_0.3-0.4	18/10/2023	S	P	1		X							
39	BH05_0.9-1.0	18/10/2023	S	P	1	X								
40	BH05_1.05-1.15	18/10/2023	S	P	1		X							
41	BH05_1.6-1.7	18/10/2023	S	P	1		X							
42	BH05_2.6-2.7	18/10/2023	S	P	1		X							
43	BH05_3.4-3.5	18/10/2023	S	P	1		X							
44	BH05_3.9-4.0	18/10/2023	S	P	1		X							
45	BH06_PAVAR	18/10/2023	S	P	1		X							
46	BH06_0.08-0.12	18/10/2023	S	P	1		X							
47	BH06_0.3-0.4	18/10/2023	S	P	1	X								
48	BH06_1.0-1.1	18/10/2023	S	P	1	X								
TOTAL					12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Special bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	☒ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	ALS QUOTE:	COC SEQUENCE NUMBER (Circle)	Custody Seal Intact?	Yes No N/A
PROJECT: MFS PORT ADELAIDE DSI	ORDER NO.: 12616804	COC: 1 2 3 4 5 6 7	Free ice / frozen ice bricks present upon receipt?	Yes No N/A
PROJECT MANAGER: Angus Robinson	CONTACT PH: 0431 177 498	OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt:	°C
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey)	SAMPLER MOBILE: 0467 034 756	RELINQUISHED BY: Terrence Wilson	RECEIVED BY: Kieren Burns	RELINQUISHED BY:
COC emailed to ALS? YES	EDD FORMAT (or default): Esdat	DATE/TIME: 19 October 2023; 15:00	DATE/TIME: 19 October 2023; 15:00	RECEIVED BY: M. Wilson DATE/TIME: 24/10/23
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHDLabReports@ghd.com				
Email Invoice to: Angus.Robinson@ghd.com; accountspayableAU@ghd.com				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED Including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
49	BH06_1.6-1.7	18/10/2023	S	P	1		X							
50	BH06_2.6-2.7	18/10/2320	S	P	1		X							
51	BH06_2.9-3.0	18/10/2617	S	P	1		X							
52	BH07_PAVAR	18/10/2914	S	P	1		X							
53	BH07_0.08-0.12	18/10/3211	S	P	1		X							
54	BH07_0.35-0.45	18/10/3508	S	P	1	X								
55	BH07_0.9-1.0	18/10/3805	S	P	1		X							
56	BH07_1.8-1.9	18/10/4102	S	P	1	X								
57	BH07_2.5-2.6	18/10/4399	S	P	1		X							
58	BH07_2.9-3.0	18/10/4696	S	P	1		X							
59	BH07_3.4-3.5	18/10/2023	S	P	1		X							
60	SS01	18/10/2320	S	P	1	X								
TOTAL					12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS : ☒ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal intact? Yes No N/A	
PROJECT: MFS PORT ADELAIDE DSI	ALS QUOTE:	Free ice / frozen ice bricks present upon receipt? Yes No N/A	
PROJECT MANAGER: Angus Robinson	ORDER NO.: 12516804	Random Sample Temperature on Receipt: °C	
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey)	SAMPLER MOBILE: 0467 034 756	Other comment:	
COC emailed to ALS? YES	EDD FORMAT (or default): Esdat	RECEIVED BY: Kieren Burns	RECEIVED BY: <i>Moon</i>
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Patticrew@ghd.com; GHDLabReports@ghd.com	RELINQUISHED BY: Terrence Wilson	DATE/TIME: 19 October 2023; 15:00	DATE/TIME: 24/10/23
Email Invoice to: Angus.Robinson@ghd.com; accounts payableAU@ghd.com	DATE/TIME: 19 October 2023; 15:00	DATE/TIME:	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
61	SS02	18/10/2023	S	P	1	X								
62	SS03	18/10/2023	S	P	1	X								
63	SS04	18/10/2023	S	P	1	X								
64	SS05	18/10/2023	S	P	1	X								
65	SS06	18/10/2023	S	P	1	X								
66	SS07	18/10/2023	S	P	1	X								
67	SS08	18/10/2023	S	P	1	X								
68	SS09	18/10/2023	S	P	1		X							
69	SS10	18/10/2023	S	P	1	X								
70	SS11	18/10/2023	S	P	1	X								
71	MW01_PAVAR	19/10/2023	S	P	1		X							
72	MW01_0.08-0.18	19/10/2023	S	P	1	X								
TOTAL					12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag



CHAIN OF CUSTODY

ALS Laboratory
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS: ☒ Standard TAT (LIM due date): (Standard TAT may be longer for some tests e.g. Urea, Creatinine)	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	☐ Non Standard or urgent TAT (List due date):	Quantity Sent (kg/L)?	Yes No NA
PROJECT: MFS PORT ADELAIDE DSI	ALS QUOTE: ORDER NO: 12616604	Free ice / frozen ice bricks present (specify)?	Yes No NA
PROJECT MANAGER: Angus Robinson	CONTACT PH: 0431 177 499	Random Sample Temperature on Receipt:	C
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey)	SAMPLER MOBILE: 0467 824 756	Other comment:	
COC emailed to ALS? YES	EDD FORMAT (or default): Eddat	RECEIVED BY: Terrence Wilson	RECEIVED BY: <i>[Signature]</i>
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Pedersen@ghd.com;	DATE/TIME: 18 October 2023, 15:00	DATE/TIME: 19 October 2023, 15:00	DATE/TIME:
GHDLabReports@ghd.com			
Email Invoice to: Angus.Robinson@ghd.com; accounts payableAU@ghd.com			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIZ: SOLID (S) WATER (W)		CONTAINER INFORMATION			ANALYSIS REQUIRED including SUITES (nil, Site Codes must be listed to attract same price) Where Matrix is required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).										Additional Information		
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE <i>(refer to codes below)</i>	TOTAL CONTAINERS	PFAS (Long Chain) + Standard LCR	HOLD											Comments on any contaminant levels, dilutions, or samples requiring specific COC analysis etc.
73	MW01_0.3-0.4	19/10/2023	S	P	1		X											
74	MW01_0.5-0.6	19/10/2023	S	P	1		X											
75	MW01_1.0-1.1	19/10/2023	S	P	1		X											
76	MW01_1.8-1.9	19/10/2023	S	P	1		X											
77	MW01_2.7-2.8	19/10/2023	S	P	1		X											
78	MW01_3.4-3.5	19/10/2023	S	P	1	X												
79	MW01_3.9-4.0	19/10/2023	S	P	1		X											
80	MW02_PAVAR	19/10/2023	S	P	1		X											
81	MW02_0.55-0.16	19/10/2023	S	P	1	X												
82	MW02_0.3-0.4	19/10/2023	S	P	1		X											
83	MW02_1.3-1.4	19/10/2023	S	P	1	X												
84	MW02_1.7-1.8	19/10/2023	S	P	1		X											
TOTAL					12													

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; DLD = Nitric Preserved DLD; S1 = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airtight Unpreserved Plastic;
V = VOA Vol HCl Preserved; VB = VOA Vol Sodium Borohydride Preserved; VS = VOA Vol Sulfuric Preserved; AV = Amalgam Unpreserved; Vd = Sulfuric Preserved Amber Glass; H = HCl Unpreserved Plastic; H5 = HCl Unpreserved Sorption bottle; SP = Sulfuric Preserved Plastic; F = Formic Acid Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; BT = Borate Buffer; ASG = Plastic Bag for Acid Substrate; B = Unpreserved Bag.



CHAIN OF CUSTODY

ALS Laboratory
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS: ☒ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	(Standard TAT may be longer for some tests e.g. Ultra Trace Elements) ☐ Non Standard or urgent TAT (List due date):	Cosmoly Seal intact?	Yes No N/A
PROJECT: MFS PORT ADELAIDE DSI	ALS QUOTE: ORDER NO.: 12616504	Free Ice / frozen ice bricks present upon receipt?	Yes No N/A
PROJECT MANAGER: Angus Robinson	CONTACT PH: 0431 177 496	Random Sample Temperature on Receipt:	°C
SAMPLER: TW (Terrence Wilson), NP (Nicole Peachey)	SAMPLER MOBILE: 0467 924 756	Other comment:	
COC emailed to ALS? YES	EDD FORMAT (or default): Endat	RELINQUISHED BY: Terrence Wilson	RECEIVED BY: Kieren Burns
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHD.ad@reports@ghd.com	DATE/TIME: 19 October 2023; 15:00	DATE/TIME: 19 October 2023; 15:00	DATE/TIME: <i>19/10/23</i>
Email Invoice to: Angus.Robinson@ghd.com; accounts.payableAU@ghd.com			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (N/A. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (first filtered bottle required).										Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE <i>(refer to codes below)</i>	TOTAL CONTAINERS	PPAS (Long Sub-) Standard LOR	HOLD										Comments on likely contaminant levels, dilutions, or samples requiring specific GC analysis etc.
85	MW02_2.7-2.8	19/10/2023	S	P	1	X											
86	MW02_3.4-3.5	19/10/2023	S	P	1		X										
87	MW02_3.5-4.0	19/10/2023	S	P	1		X										
88	MW03_PAYER	19/10/2023	S	P	1		X										
89	MW03_0.08-0.2	19/10/2023	S	P	1		X										
90	MW03_0.3-0.4	19/10/2023	S	P	1		X										
91	MW03_1.0-1.12	19/10/2023	S	P	1		X										
92	MW03_1.8-1.9	19/10/2023	S	P	1	X											
93	MW03_2.4-2.5	19/10/2023	S	P	1		X										
94	MW03_3.0-3.1	19/10/2023	S	P	1		X										
95	MW03_3.4-3.5	19/10/2023	S	P	1	X											
96	MW03_3.8-4.0	19/10/2023	S	P	1		X										
TOTAL					12												

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; DMC = Nitric Preserved DMC; SH = Sodium Hydroxide Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Amber Glass Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Borate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airtight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HG = HCl preserved Sealed bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ST = Shade Bottle; ABS = Plastic Bag for Acid Sulfate Solids; B = Unpreserved Bag.



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS : ☒ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)	
OFFICE: Adelaide	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A	
PROJECT: MFS CAMDEN PARK DSI	ALS QUOTE:	Free ice / frozen ice bricks present upon receipt? Yes No N/A	
PROJECT MANAGER: Angus Robinson	ORDER NO.: 12616802	Random Sample Temperature on Receipt: °C	
SAMPLER: TW (Terrence Wilson)	CONTACT PH: 0431 177 498	Other comment:	
COC emailed to ALS? YES	EDD FORMAT (or default): Esdat	RECEIVED BY: Kieren Burns	RECEIVED BY:
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHDLabReports@ghd.com	RELINQUISHED BY: Terrence Wilson	DATE/TIME: 17 October 2023; 15:00	DATE/TIME: 24/10 12:30
Email Invoice to: Angus.Robinson@ghd.com; accountspayableAU@ghd.com	DATE/TIME: 17 October 2023; 15:00	DATE/TIME:	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB, Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD						FORWARD TO EUROFINS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
97	FD01	18/10/2023	S	P	1		X							
98	FS01	18/10/2023	S	P	1		X							
99	FD02	18/10/2023	S	P	1	X								
-	FS02	18/10/2023	S	P	1	X						X		
100	FD03	18/10/2023	S	P	1	X								PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
-	FS03	18/10/2023	S	P	1	X						X		PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
101	FD04	18/10/2023	S	P	1	X								
-	FS04	18/10/2023	S	P	1	X						X		PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
102	FB01	18/10/2023	W	P	1	X								
103	RB01	18/10/2023	W	P	1	X								
104	FD05	19/10/2023	S	P	1	X								
-	FS05	19/10/2023	S	P	1	X						X		PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
TOTAL					12									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Solids; B = Unpreserved Bag.



COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; GRG = Nitric Preserved Glass; SH = Sodium Hydroxide/Gel Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Aqueous Unpreserved Plastic; V = Vial Val HD Preserved; VB = Vial Val Sodium Hydroxide Preserved; VS = Vial Val Nitric Preserved; AA = Aqueous Unpreserved Vial SD = Silbuck Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Specimen Bottle; SP = Silbuck Preserved Plastic; F = Formaldehyde Preserved Glass

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; GRG = Nitric Preserved GRG; SH = Sodium Hydroxide/Cl Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airtight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulfate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airtight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottle; ST = Sterile Bottle; ASS = Plastic Bag for Acid Substrate Solids; IU = Unpreserved Bag



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM2319006**

Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: angus.robinson@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: MFS PORT ADELAIDE DSI	Page	: 1 of 5
Order number	: ----	Quote number	: EM2021GHDSE0057 (MEBQ/005/21 (Vic Only, Primary))
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Nicole Peachey, Terrence Wilson		

Dates

Date Samples Received	: 24-Oct-2023 12:30	Issue Date	: 25-Oct-2023
Client Requested Due Date	: 31-Oct-2023	Scheduled Reporting Date	: 31-Oct-2023

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 9.2°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 106 / 42

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **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: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EM2319006-001	18-Oct-2023 00:00	BH01_PAVER	✓		
EM2319006-002	18-Oct-2023 00:00	BH01_0.08-0.12		✓	✓
EM2319006-003	18-Oct-2023 00:00	BH01_0.3-0.4	✓		
EM2319006-004	18-Oct-2023 00:00	BH01_0.9-1.0	✓		
EM2319006-005	18-Oct-2023 00:00	BH01_1.4-1.5		✓	✓
EM2319006-006	18-Oct-2023 00:00	BH01_2.2-2.3	✓		
EM2319006-007	18-Oct-2023 00:00	BH01_2.4-2.5	✓		
EM2319006-008	18-Oct-2023 00:00	BH01_2.9-3.0	✓		
EM2319006-009	18-Oct-2023 00:00	BH01_3.4-3.5	✓		
EM2319006-010	18-Oct-2023 00:00	BH02_PAVER	✓		
EM2319006-011	18-Oct-2023 00:00	BH02_0.08-0.12	✓		
EM2319006-012	18-Oct-2023 00:00	BH02_0.3-0.4		✓	✓
EM2319006-013	18-Oct-2023 00:00	BH02_0.75-0.85	✓		
EM2319006-014	18-Oct-2023 00:00	BH02_1.5-1.6	✓		
EM2319006-015	18-Oct-2023 00:00	BH02_2.5-2.6		✓	✓
EM2319006-016	18-Oct-2023 00:00	BH02_2.9-3.0	✓		
EM2319006-017	18-Oct-2023 00:00	BH02_3.4-3.5	✓		
EM2319006-018	18-Oct-2023 00:00	BH03_PAVER	✓		
EM2319006-019	18-Oct-2023 00:00	BH03_0.08-0.18		✓	✓
EM2319006-020	18-Oct-2023 00:00	BH03_0.3-0.4	✓		
EM2319006-021	18-Oct-2023 00:00	BH03_0.6-0.7		✓	✓
EM2319006-022	18-Oct-2023 00:00	BH03_0.7-0.75	✓		
EM2319006-023	18-Oct-2023 00:00	BH03_0.9-1.0		✓	✓
EM2319006-024	18-Oct-2023 00:00	BH03_1.5-1.6	✓		
EM2319006-025	18-Oct-2023 00:00	BH03_2.5-2.6	✓		
EM2319006-026	18-Oct-2023 00:00	BH03_3.0-3.1	✓		
EM2319006-027	18-Oct-2023 00:00	BH03_3.4-3.5	✓		
EM2319006-028	18-Oct-2023 00:00	BH04_PAVER		✓	✓
EM2319006-029	18-Oct-2023 00:00	BH04_0.08-0.18		✓	✓
EM2319006-030	18-Oct-2023 00:00	BH04_0.2-0.3		✓	✓
EM2319006-031	18-Oct-2023 00:00	BH04_0.6-0.7	✓		
EM2319006-032	18-Oct-2023 00:00	BH04_1.4-1.5	✓		
EM2319006-033	18-Oct-2023 00:00	BH04_2.4-2.5	✓		
EM2319006-034	18-Oct-2023 00:00	BH04_2.9-3.0		✓	✓
EM2319006-035	18-Oct-2023 00:00	BH04_3.4-3.5	✓		



			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EM2319006-036	18-Oct-2023 00:00	BH05_PAVER	✓		
EM2319006-037	18-Oct-2023 00:00	BH05_0.08-0.12		✓	✓
EM2319006-038	18-Oct-2023 00:00	BH05_0.3-0.4	✓		
EM2319006-039	18-Oct-2023 00:00	BH05_0.9-1.0		✓	✓
EM2319006-040	18-Oct-2023 00:00	BH05_1.05-1.15	✓		
EM2319006-041	18-Oct-2023 00:00	BH05_1.6-1.7	✓		
EM2319006-042	18-Oct-2023 00:00	BH05_2.6-2.7	✓		
EM2319006-043	18-Oct-2023 00:00	BH05_3.4-3.5	✓		
EM2319006-044	18-Oct-2023 00:00	BH05_3.9-4.0	✓		
EM2319006-045	18-Oct-2023 00:00	BH06_PAVER	✓		
EM2319006-046	18-Oct-2023 00:00	BH06_0.08-0.12	✓		
EM2319006-047	18-Oct-2023 00:00	BH06_0.3-0.4		✓	✓
EM2319006-048	18-Oct-2023 00:00	BH06_1.0-1.1		✓	✓
EM2319006-049	18-Oct-2023 00:00	BH06_1.6-1.7	✓		
EM2319006-050	18-Oct-2023 00:00	BH06_2.6-2.7	✓		
EM2319006-051	18-Oct-2023 00:00	BH06_2.9-3.0	✓		
EM2319006-052	18-Oct-2023 00:00	BH07_PAVER	✓		
EM2319006-053	18-Oct-2023 00:00	BH07_0.08-0.12	✓		
EM2319006-054	18-Oct-2023 00:00	BH07_0.35-0.45		✓	✓
EM2319006-055	18-Oct-2023 00:00	BH07_0.9-1.0	✓		
EM2319006-056	18-Oct-2023 00:00	BH07_1.8-1.9		✓	✓
EM2319006-057	18-Oct-2023 00:00	BH07_2.5-2.6	✓		
EM2319006-058	18-Oct-2023 00:00	BH07_2.9-3.0	✓		
EM2319006-059	18-Oct-2023 00:00	BH07_3.4-3.5	✓		
EM2319006-060	18-Oct-2023 00:00	SS01		✓	✓
EM2319006-061	18-Oct-2023 00:00	SS02		✓	✓
EM2319006-062	18-Oct-2023 00:00	SS03		✓	✓
EM2319006-063	18-Oct-2023 00:00	SS04		✓	✓
EM2319006-064	18-Oct-2023 00:00	SS05		✓	✓
EM2319006-065	18-Oct-2023 00:00	SS06		✓	✓
EM2319006-066	18-Oct-2023 00:00	SS07		✓	✓
EM2319006-067	18-Oct-2023 00:00	SS08		✓	✓
EM2319006-068	18-Oct-2023 00:00	SS09	✓		
EM2319006-069	18-Oct-2023 00:00	SS10		✓	✓
EM2319006-070	18-Oct-2023 00:00	SS11		✓	✓
EM2319006-071	19-Oct-2023 00:00	MW01_PAVER	✓		
EM2319006-072	19-Oct-2023 00:00	MW01_0.08-0.18		✓	✓
EM2319006-073	19-Oct-2023 00:00	MW01_0.3-0.4	✓		
EM2319006-074	19-Oct-2023 00:00	MW01_0.5-0.6	✓		
EM2319006-075	19-Oct-2023 00:00	MW01_1.0-1.1	✓		
EM2319006-076	19-Oct-2023 00:00	MW01_1.8-1.9	✓		



			(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EM2319006-077	19-Oct-2023 00:00	MW01_2.7-2.8	✓		
EM2319006-078	19-Oct-2023 00:00	MW01_3.4-3.5		✓	✓
EM2319006-079	19-Oct-2023 00:00	MW01_3.9-4.0	✓		
EM2319006-080	19-Oct-2023 00:00	MW02_PAVER	✓		
EM2319006-081	19-Oct-2023 00:00	MW02_0.08-0.18		✓	✓
EM2319006-082	19-Oct-2023 00:00	MW02_0.3-0.4	✓		
EM2319006-083	19-Oct-2023 00:00	MW02_1.3-1.4		✓	✓
EM2319006-084	19-Oct-2023 00:00	MW02_1.7-1.8	✓		
EM2319006-085	19-Oct-2023 00:00	MW02_2.7-2.8		✓	✓
EM2319006-086	19-Oct-2023 00:00	MW02_3.4-3.5	✓		
EM2319006-087	19-Oct-2023 00:00	MW02_3.9-4.0	✓		
EM2319006-088	19-Oct-2023 00:00	MW03_PAVER	✓		
EM2319006-089	19-Oct-2023 00:00	MW03_0.08-0.2	✓		
EM2319006-090	19-Oct-2023 00:00	MW03_0.3-0.4	✓		
EM2319006-091	19-Oct-2023 00:00	MW03_1.0-1.12	✓		
EM2319006-092	19-Oct-2023 00:00	MW03_1.8-1.9		✓	✓
EM2319006-093	19-Oct-2023 00:00	MW03_2.4-2.5	✓		
EM2319006-094	19-Oct-2023 00:00	MW03_3.0-3.1	✓		
EM2319006-095	19-Oct-2023 00:00	MW03_3.4-3.5		✓	✓
EM2319006-096	19-Oct-2023 00:00	MW03_3.9-4.0	✓		
EM2319006-097	18-Oct-2023 00:00	FD01	✓		
EM2319006-098	18-Oct-2023 00:00	FS01	✓		
EM2319006-099	18-Oct-2023 00:00	FD02		✓	✓
EM2319006-100	18-Oct-2023 00:00	FD03		✓	✓
EM2319006-101	18-Oct-2023 00:00	FD04		✓	✓
EM2319006-104	19-Oct-2023 00:00	FD05		✓	✓



Matrix: WATER

Laboratory sample ID	Sampling date / time	Sample ID	Water PFAS -
EM2319006-102	18-Oct-2023 00:00	FB01	✓
EM2319006-103	18-Oct-2023 00:00	RB01	✓
EM2319006-105	19-Oct-2023 00:00	FB02	✓
EM2319006-106	19-Oct-2023 00:00	RB02	✓

Proactive Holding Time Report

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

Requested Deliverables

Accounts Payable Australia

- A4 - AU Tax Invoice (INV)

Email accountspayableAU@ghd.com

ANGUS ROBINSON

- *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)
- A4 - AU Tax Invoice (INV)
- Chain of Custody (CoC) (COC)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

BEN PETTICREW

- *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 - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

GHD LAB REPORTS

- *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 - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

Terrence Wilson

- *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 - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]



QUALITY CONTROL REPORT

Work Order	: EM2319006	Page	: 1 of 16
Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: MFS PORT ADELAIDE DSI	Date Samples Received	: 24-Oct-2023
Order number	: ----	Date Analysis Commenced	: 25-Oct-2023
C-O-C number	: ----	Issue Date	: 31-Oct-2023
Sampler	: Nicole Peachey, Terrence Wilson		
Site	: ----		
Quote number	: EN/000		
No. of samples received	: 106		
No. of samples analysed	: 42		



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
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC



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.

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5383278)									
EM2319006-002	BH01_0.08-0.12	EA055: Moisture Content	----	0.1	%	4.2	4.3	3.1	0% - 20%
EM2319006-034	BH04_2.9-3.0	EA055: Moisture Content	----	0.1	%	44.4	45.8	3.2	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5383279)									
EM2319006-063	SS04	EA055: Moisture Content	----	0.1	%	22.1	21.0	5.3	0% - 20%
EM2319006-083	MW02_1.3-1.4	EA055: Moisture Content	----	0.1	%	30.5	29.9	2.2	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5386037)									
EM2319006-002	BH01_0.08-0.12	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0007	0.0008	17.6	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0079	0.0074	6.7	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0021	0.0014	38.9	0% - 50%
EM2319006-034	BH04_2.9-3.0	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0014	0.0017	23.4	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0022	0.0021	5.1	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0104	0.0121	15.3	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0037	0.0038	3.3	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5387792)									
EM2319006-063	SS04	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0014	0.0015	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0008	0.0010	17.9	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0141	0.0170	18.4	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0010	0.0014	28.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5387792) - continued									
EM2319006-063	SS04	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.148	0.157	5.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0032	0.0027	18.6	0% - 50%
EM2319006-083	MW02_1.3-1.4	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0026	0.0025	0.0	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0053	0.0053	0.0	0% - 20%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0308	0.0314	1.8	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5386037)									
EM2319006-002	BH01_0.08-0.12	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0002	0.0003	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0003	0.0004	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0008	0.0006	26.9	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2319006-034	BH04_2.9-3.0	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0005	0.0007	22.6	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0027	0.0028	4.7	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0006	0.0007	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5387792)									
EM2319006-063	SS04	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0030	0.0028	4.9	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0032	0.0034	4.3	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0018	0.0022	15.8	0% - 50%
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0021	0.0025	16.0	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0044	0.0045	0.0	0% - 20%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0011	0.0011	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0015	0.0015	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0005	0.0004	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5387792) - continued									
EM2319006-063	SS04	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EM2319006-083	MW02_1.3-1.4	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0013	0.0014	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0083	0.0082	1.8	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0014	0.0014	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0006	0.0006	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDODA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5386037)									
EM2319006-002	BH01_0.08-0.12	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2319006-034	BH04_2.9-3.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5387792)									
EM2319006-063	SS04	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0006	0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2319006-083	MW02_1.3-1.4	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5386037)									
EM2319006-002	BH01_0.08-0.12	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0010	0.0010	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	0.0011	0.0010	16.6	No Limit
EM2319006-034	BH04_2.9-3.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5384451) - continued									
EM2319006-102	FB01	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		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: 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: 5384451)									
EM2319006-102	FB01	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: 5384451)									
EM2319006-102	FB01	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: 5384451)									
EM2319006-102	FB01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5384451) - continued									
EM2319006-102	FB01	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: 5384451)									
EM2319006-102	FB01	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	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: **SOIL**

Sub-Matrix: SOIL				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: 5386037)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00111 mg/kg	87.6	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	95.1	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00114 mg/kg	92.7	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	101	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	97.3	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00121 mg/kg	96.5	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5387792)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00111 mg/kg	89.6	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	92.3	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00114 mg/kg	98.6	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	97.1	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	91.2	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00121 mg/kg	85.6	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5386037)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	89.1	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.1	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.3	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.5	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.3	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.5	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.2	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.7	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5387792)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	91.9	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.8	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.6	71.0	131



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				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: 5387792) - continued								
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.7	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.9	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.6	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.9	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.2	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.5	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	94.4	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5386037)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.9	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.9	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	97.6	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.4	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.4	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.5	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5387792)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	107	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	101	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	94.5	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	89.0	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5386037)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	89.4	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	95.2	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	92.1	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	86.0	70.0	130



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound		CAS Number	LOR		Unit	Result	Spike Concentration	Spike Recovery (%) LCS
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5387792)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)		757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	97.3	62.0145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)		27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	95.2	64.0140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)		39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	96.4	65.0137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)		120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	82.6	70.0130
EP231P: PFAS Sums (QCLot: 5386037)								
EP231X: Sum of PFAS		----	0.0002	mg/kg	<0.0002	----	----	-----
EP231X: Sum of PFHxS and PFOS		355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	-----
EP231X: Sum of PFAS (WA DER List)		----	0.0002	mg/kg	<0.0002	----	----	-----
EP231P: PFAS Sums (QCLot: 5387792)								
EP231X: Sum of PFAS		----	0.0002	mg/kg	<0.0002	----	----	-----
EP231X: Sum of PFHxS and PFOS		355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	-----
EP231X: Sum of PFAS (WA DER List)		----	0.0002	mg/kg	<0.0002	----	----	-----

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) LowHigh	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5384451)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.222 µg/L	89.0	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.235 µg/L	96.5	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.228 µg/L	92.7	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.238 µg/L	86.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.232 µg/L	108	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.241 µg/L	93.4	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5384451)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	80.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	77.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	82.0	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	88.7	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	90.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	90.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	85.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	96.6	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	81.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	74.5	65.0	144



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: 5384451) - continued								
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.9	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5384451)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	91.5	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	95.9	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	101	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	84.8	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	94.3	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	85.2	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	84.7	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5384451)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.234 µg/L	86.3	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.238 µg/L	100	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.24 µg/L	120	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.242 µg/L	108	70.0	130
EP231P: PFAS Sums (QCLot: 5384451)								
EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

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

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5386037)							
EM2319006-005	BH01_1.4-1.5	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	# 59.8	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00118 mg/kg	96.4	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	# Not Determined	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00119 mg/kg	72.9	70.0	132



Sub-Matrix: SOIL

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5386037) - continued							
EM2319006-005	BH01_1.4-1.5	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	102	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00121 mg/kg	59.0	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5387792)							
EM2319006-064	SS05	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	103	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00118 mg/kg	115	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	# Not Determined	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00119 mg/kg	119	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00121 mg/kg	# Not Determined	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5386037)							
EM2319006-005	BH01_1.4-1.5	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	84.3	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	91.7	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	# Not Determined	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	92.9	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	77.2	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	92.3	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	87.3	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	67.0	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	94.5	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.00125 mg/kg	80.7	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	84.6	69.0	133		
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5387792)							
EM2319006-064	SS05	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	104	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	123	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	# Not Determined	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	111	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	# Not Determined	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	# Not Determined	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	90.7	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	105	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	100	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.00125 mg/kg	106	66.0	139



Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5387792) - continued							
EM2319006-064	SS05	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	97.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5386037)							
EM2319006-005	BH01_1.4-1.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	84.4	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	93.7	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	89.3	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	98.3	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 68.1	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	80.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	66.2	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5387792)							
EM2319006-064	SS05	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	# Not Determined	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	110	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	70.8	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	91.2	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	79.5	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	80.4	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	119	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5386037)							
EM2319006-005	BH01_1.4-1.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	87.8	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	79.2	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	86.4	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	90.9	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5387792)							
EM2319006-064	SS05	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	89.3	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	# Not Determined	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	# Not Determined	65.0	137



Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5387792) - continued							
EM2319006-064	SS05	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	91.0	70.0	130
Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5384451)							
EM2319054-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.222 µg/L	81.9	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.235 µg/L	85.3	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.228 µg/L	90.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.238 µg/L	88.2	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.232 µg/L	125	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.241 µg/L	97.9	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5384451)							
EM2319054-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	84.5	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	80.0	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	86.3	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	88.5	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	90.3	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	91.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	86.1	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	89.1	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	85.0	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	77.2	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	92.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5384451)							
EM2319054-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	92.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	91.4	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	98.9	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	87.7	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	93.5	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	82.8	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	91.6	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5384451)							
EM2319054-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.234 µg/L	84.1	63.0	143



Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
				Concentration	MS	Low	High
Laboratory sample ID	Sample ID	Method: Compound	CAS Number				
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5384451) - continued							
EM2319054-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.238 µg/L	86.7	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.24 µg/L	97.5	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.242 µg/L	86.4	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM2319006	Page	: 1 of 11
Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Telephone	: +6138549 9645
Project	: MFS PORT ADELAIDE DSI	Date Samples Received	: 24-Oct-2023
Site	: ----	Issue Date	: 31-Oct-2023
Sampler	: Nicole Peachey, Terrence Wilson	No. of samples received	: 106
Order number	: ----	No. of samples analysed	: 42

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EM2319006--005	BH01_1.4-1.5	Perfluorobutane sulfonic acid (PFBS)	375-73-5	59.8 %	72.0-128%	Recovery less than lower data quality objective
EP231A: Perfluoroalkyl Sulfonic Acids	EM2319006--005	BH01_1.4-1.5	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	EM2319006--064	SS05	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	EM2319006--064	SS05	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EM2319006--064	SS05	Perfluorodecane sulfonic acid (PFDS)	335-77-3	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	EM2319006--005	BH01_1.4-1.5	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	EM2319006--064	SS05	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	EM2319006--064	SS05	Perfluorooctanoic acid (PFOA)	335-67-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231C: Perfluoroalkyl Sulfonamides	EM2319006--005	BH01_1.4-1.5	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	68.1 %	70.0-130%	Recovery less than lower data quality objective
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2319006--064	SS05	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2319006--064	SS05	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.



Analysis Holding Time Compliance

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

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

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

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

Matrix: SOIL

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

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA055: Moisture Content (Dried @ 105-110°C)								
HDPE Soil Jar (EA055) BH01_0.08-0.12, BH02_0.3-0.4, BH03_0.08-0.18, BH03_0.9-1.0, BH04_0.08-0.18, BH04_2.9-3.0, BH05_0.9-1.0, BH06_1.0-1.1, BH07_1.8-1.9, SS02, SS04, SS06, SS08, SS11, FD03, BH01_1.4-1.5, BH02_2.5-2.6, BH03_0.6-0.7, BH04_PAVER, BH04_0.2-0.3, BH05_0.08-0.12, BH06_0.3-0.4, BH07_0.35-0.45, SS01, SS03, SS05, SS07, SS10, FD02, FD04	18-Oct-2023	----	----	----	25-Oct-2023	01-Nov-2023	✓	
HDPE Soil Jar (EA055) MW01_0.08-0.18, MW02_0.08-0.18, MW02_2.7-2.8, MW03_3.4-3.5, MW01_3.4-3.5, MW02_1.3-1.4, MW03_1.8-1.9, FD05	19-Oct-2023	----	----	----	25-Oct-2023	02-Nov-2023	✓	

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 Soil Jar (EP231X)		18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	30-Oct-2023	05-Dec-2023	✓
BH01_0.08-0.12, BH01_1.4-1.5,								
BH02_0.3-0.4, BH02_2.5-2.6,								
BH03_0.08-0.18, BH03_0.6-0.7,								
BH03_0.9-1.0, BH04_PAVER,								
BH04_0.08-0.18, BH04_0.2-0.3,								
BH04_2.9-3.0, BH05_0.08-0.12,								
BH05_0.9-1.0, BH06_0.3-0.4,								
BH06_1.0-1.1, BH07_0.35-0.45,								
BH07_1.8-1.9, SS01,								
SS02, SS03								
HDPE Soil Jar (EP231X)		18-Oct-2023	27-Oct-2023	15-Apr-2024	✓	31-Oct-2023	06-Dec-2023	✓
SS04, SS05,								
SS06, SS07,								
SS08, SS10,								
SS11, FD02,								
FD03, FD04								
HDPE Soil Jar (EP231X)		19-Oct-2023	27-Oct-2023	16-Apr-2024	✓	31-Oct-2023	06-Dec-2023	✓
MW01_0.08-0.18, MW01_3.4-3.5,								
MW02_0.08-0.18, MW02_1.3-1.4,								
MW02_2.7-2.8, MW03_1.8-1.9,								
MW03_3.4-3.5, FD05								

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 Soil Jar (EP231X) BH01_0.08-0.12, BH02_0.3-0.4, BH03_0.08-0.18, BH03_0.9-1.0, BH04_0.08-0.18, BH04_2.9-3.0, BH05_0.9-1.0, BH06_1.0-1.1, BH07_1.8-1.9, SS02,		BH01_1.4-1.5, BH02_2.5-2.6, BH03_0.6-0.7, BH04_PAVER, BH04_0.2-0.3, BH05_0.08-0.12, BH06_0.3-0.4, BH07_0.35-0.45, SS01, SS03	18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	30-Oct-2023	05-Dec-2023	✓
HDPE Soil Jar (EP231X) SS04, SS06, SS08, SS11, FD03,		SS05, SS07, SS10, FD02, FD04	18-Oct-2023	27-Oct-2023	15-Apr-2024	✓	31-Oct-2023	06-Dec-2023	✓
HDPE Soil Jar (EP231X) MW01_0.08-0.18, MW02_0.08-0.18, MW02_2.7-2.8, MW03_3.4-3.5,		MW01_3.4-3.5, MW02_1.3-1.4, MW03_1.8-1.9, FD05	19-Oct-2023	27-Oct-2023	16-Apr-2024	✓	31-Oct-2023	06-Dec-2023	✓



Matrix: SOIL

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 Soil Jar (EP231X) BH01_0.08-0.12, BH02_0.3-0.4, BH03_0.08-0.18, BH03_0.9-1.0, BH04_0.08-0.18, BH04_2.9-3.0, BH05_0.9-1.0, BH06_1.0-1.1, BH07_1.8-1.9, SS02,	BH01_1.4-1.5, BH02_2.5-2.6, BH03_0.6-0.7, BH04_PAVER, BH04_0.2-0.3, BH05_0.08-0.12, BH06_0.3-0.4, BH07_0.35-0.45, SS01, SS03	18-Oct-2023	26-Oct-2023	15-Apr-2024	✔	30-Oct-2023	05-Dec-2023	✔
HDPE Soil Jar (EP231X) SS04, SS06, SS08, SS11, FD03,	SS05, SS07, SS10, FD02, FD04	18-Oct-2023	27-Oct-2023	15-Apr-2024	✔	31-Oct-2023	06-Dec-2023	✔
HDPE Soil Jar (EP231X) MW01_0.08-0.18, MW02_0.08-0.18, MW02_2.7-2.8, MW03_3.4-3.5,	MW01_3.4-3.5, MW02_1.3-1.4, MW03_1.8-1.9, FD05	19-Oct-2023	27-Oct-2023	16-Apr-2024	✔	31-Oct-2023	06-Dec-2023	✔



Matrix: SOIL

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	
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) BH01_0.08-0.12, BH02_0.3-0.4, BH03_0.08-0.18, BH03_0.9-1.0, BH04_0.08-0.18, BH04_2.9-3.0, BH05_0.9-1.0, BH06_1.0-1.1, BH07_1.8-1.9, SS02,	BH01_1.4-1.5, BH02_2.5-2.6, BH03_0.6-0.7, BH04_PAVER, BH04_0.2-0.3, BH05_0.08-0.12, BH06_0.3-0.4, BH07_0.35-0.45, SS01, SS03	18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	30-Oct-2023	05-Dec-2023	✓
HDPE Soil Jar (EP231X) SS04, SS06, SS08, SS11, FD03,	SS05, SS07, SS10, FD02, FD04	18-Oct-2023	27-Oct-2023	15-Apr-2024	✓	31-Oct-2023	06-Dec-2023	✓
HDPE Soil Jar (EP231X) MW01_0.08-0.18, MW02_0.08-0.18, MW02_2.7-2.8, MW03_3.4-3.5,	MW01_3.4-3.5, MW02_1.3-1.4, MW03_1.8-1.9, FD05	19-Oct-2023	27-Oct-2023	16-Apr-2024	✓	31-Oct-2023	06-Dec-2023	✓

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

Matrix: **WATER** Evaluation: **x** = 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) FB01, RB01	18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	26-Oct-2023	15-Apr-2024	✓	
HDPE (no PTFE) (EP231X) FB02, RB02	19-Oct-2023	26-Oct-2023	16-Apr-2024	✓	26-Oct-2023	16-Apr-2024	✓	
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) FB01, RB01	18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	26-Oct-2023	15-Apr-2024	✓	
HDPE (no PTFE) (EP231X) FB02, RB02	19-Oct-2023	26-Oct-2023	16-Apr-2024	✓	26-Oct-2023	16-Apr-2024	✓	
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) FB01, RB01	18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	26-Oct-2023	15-Apr-2024	✓	
HDPE (no PTFE) (EP231X) FB02, RB02	19-Oct-2023	26-Oct-2023	16-Apr-2024	✓	26-Oct-2023	16-Apr-2024	✓	



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	
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) FB01,	RB01	18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	26-Oct-2023	15-Apr-2024	✓
HDPE (no PTFE) (EP231X) FB02,	RB02	19-Oct-2023	26-Oct-2023	16-Apr-2024	✓	26-Oct-2023	16-Apr-2024	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) FB01,	RB01	18-Oct-2023	26-Oct-2023	15-Apr-2024	✓	26-Oct-2023	15-Apr-2024	✓
HDPE (no PTFE) (EP231X) FB02,	RB02	19-Oct-2023	26-Oct-2023	16-Apr-2024	✓	26-Oct-2023	16-Apr-2024	✓



Quality Control Parameter Frequency Compliance

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

Matrix: **SOIL**

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

Quality Control Sample Type	Method	Count		Rate (%)			Quality Control Specification
Analytical Methods		QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	4	38	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	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	Method	Count		Rate (%)			Quality Control Specification
Analytical Methods		QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
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
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.
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.



CERTIFICATE OF ANALYSIS

Work Order	: EM2319006	Page	: 1 of 21
Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: MFS PORT ADELAIDE DSI	Date Samples Received	: 24-Oct-2023 12:30
Order number	: ----	Date Analysis Commenced	: 25-Oct-2023
C-O-C number	: ----	Issue Date	: 31-Oct-2023 16:27
Sampler	: Nicole Peachey, Terrence Wilson		
Site	: ----		
Quote number	: EN/000		
No. of samples received	: 106		
No. of samples analysed	: 42		



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC



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 Contract for details.

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231X: Poor matrix spike recovery for sample EM2319006-005 due to sample matrix interference.
- EP231X: Poor matrix spike recovery for sample EM2319006-064 due to sample matrix interference. Confirmed by re-analysis.
- 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: SOIL
 (Matrix: SOIL)

Sample ID

				BH01_0.08-0.12	BH01_1.4-1.5	BH02_0.3-0.4	BH02_2.5-2.6	BH03_0.08-0.18
Sampling date / time				18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EM2319006-002	EM2319006-005	EM2319006-012	EM2319006-015	EM2319006-019
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	4.2	31.4	5.3	23.9	5.2
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0022	<0.0002	0.0004	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.0015	<0.0002	0.0003	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0007	0.0062	0.0003	0.0016	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0079	<0.0002	0.0541	0.0012	0.0214
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0021	<0.0002	<0.0002	<0.0002	0.0006
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0002	0.0018	<0.0002	0.0003	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0003	0.0071	<0.0002	0.0012	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.0007	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.0003	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0008	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	<0.0002	<0.0002	<0.0002	0.0025
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				BH01_0.08-0.12	BH01_1.4-1.5	BH02_0.3-0.4	BH02_2.5-2.6	BH03_0.08-0.18
Sampling date / time				18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EM2319006-002	EM2319006-005	EM2319006-012	EM2319006-015	EM2319006-019
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0010	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	0.0011	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0144	0.0198	0.0544	0.0050	0.0245
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0086	0.0062	0.0544	0.0028	0.0214
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0101	0.0183	0.0544	0.0047	0.0214
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	108	116	122	125	110
13C8-PFOA	----	0.0002	%	95.0	104	102	103	106



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH03_0.6-0.7	BH03_0.9-1.0	BH04_PAVER	BH04_0.08-0.18	BH04_0.2-0.3
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-021	EM2319006-023	EM2319006-028	EM2319006-029	EM2319006-030
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		8.0	23.2	6.0	3.3	3.8
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	0.0005	0.0013	<0.0002	0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0051	0.0166	0.0200	0.0002	0.0134
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		0.0014	0.0006	0.0008	<0.0002	0.0016
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.467	0.0006	0.0459	0.0177	0.518
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	0.0029	0.0006	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	0.0006	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		0.0003	0.0018	0.0036	<0.0002	0.0011
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	0.0002	0.0010	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		0.0004	0.0019	0.0019	<0.0002	0.0008
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	0.0024	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	0.0003	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	0.0008	0.0006	0.0012
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH03_0.6-0.7	BH03_0.9-1.0	BH04_PAVER	BH04_0.08-0.18	BH04_0.2-0.3
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-021	EM2319006-023	EM2319006-028	EM2319006-029	EM2319006-030
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.474	0.0228	0.0809	0.0191	0.536
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.472	0.0172	0.0659	0.0179	0.531
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.473	0.0217	0.0724	0.0179	0.533
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		111	126	121	120	120
13C8-PFOA	----	0.0002	%		95.8	104	78.0	101	101



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				BH04_2.9-3.0	BH05_0.08-0.12	BH05_0.9-1.0	BH06_0.3-0.4	BH06_1.0-1.1
Sampling date / time				18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EM2319006-034	EM2319006-037	EM2319006-039	EM2319006-047	EM2319006-048
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	44.4	7.4	7.7	14.8	20.8
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0014	<0.0002	0.0066	0.0002	0.0030
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0022	<0.0002	0.0131	0.0003	0.0052
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0104	0.0026	0.237	0.0085	0.0766
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0155	0.0008	0.0003
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0037	0.0129	0.0156	0.324	0.0008
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0027	<0.0002	0.0012	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.002	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0005	0.0004	0.0122	0.0007	0.0042
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0027	0.0007	0.0283	0.0021	0.0150
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0006	<0.0002	0.0040	0.0002	0.0019
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.0004	0.0226	0.0010	0.0034
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.0010	<0.0002	0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.0014	<0.0002	0.0008	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				BH04_2.9-3.0	BH05_0.08-0.12	BH05_0.9-1.0	BH06_0.3-0.4	BH06_1.0-1.1
Sampling date / time				18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EM2319006-034	EM2319006-037	EM2319006-039	EM2319006-047	EM2319006-048
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0201	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0215	0.0424	0.357	0.340	0.110
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0141	0.0155	0.253	0.332	0.0774
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0193	0.0371	0.328	0.337	0.105
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	125	104	111	122	127
13C8-PFOA	----	0.0002	%	97.7	93.2	99.8	106	96.0



Analytical Results

Sub-Matrix: SOIL
 (Matrix: SOIL)

Sample ID

				BH07_0.35-0.45	BH07_1.8-1.9	SS01	SS02	SS03
Sampling date / time				18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EM2319006-054	EM2319006-056	EM2319006-060	EM2319006-061	EM2319006-062
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	3.7	28.1	6.2	2.0	2.1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0028	0.0078	<0.0002	0.0005	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0024	0.0057	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0223	0.0215	<0.0002	0.0012	0.0019
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0020	<0.0002	<0.0002	<0.0002	0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.480	0.0007	0.0137	0.0055	0.0363
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0005	<0.0002	<0.0002	<0.0002	0.0081
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.002	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0042	0.0043	<0.0002	<0.0002	0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0166	0.0145	<0.0002	<0.0002	0.0003
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0011	0.0008	<0.0002	<0.0002	0.0003
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0030	0.0003	<0.0002	<0.0002	0.0007
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0009	<0.0002	<0.0002	<0.0002	0.0006
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0038	<0.0002	0.0004	<0.0002	0.0004
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0003	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0002	<0.0002	<0.0002	<0.0002	0.0002
Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0007	<0.0002	<0.0002	<0.0002	0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH07_0.35-0.45	BH07_1.8-1.9	SS01	SS02	SS03
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-054	EM2319006-056	EM2319006-060	EM2319006-061	EM2319006-062
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		0.0138	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		0.0188	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		0.0073	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.581	0.0576	0.0141	0.0072	0.0494
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.502	0.0222	0.0137	0.0067	0.0382
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.563	0.0519	0.0137	0.0072	0.0397
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		120	97.8	109	120	131
13C8-PFOA	----	0.0002	%		106	95.0	97.5	99.8	95.2



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS04	SS05	SS06	SS07	SS08
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-063	EM2319006-064	EM2319006-065	EM2319006-066	EM2319006-067
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		22.1	2.6	4.5	3.3	1.4
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		0.0014	0.0007	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		0.0008	0.0007	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0141	0.0111	0.0017	0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		0.0010	0.0017	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.148	0.397	0.0165	0.0072	0.0063
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0032	0.0221	0.0006	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	0.002	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		0.0030	0.0033	0.0040	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		0.0032	0.0045	0.0018	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		0.0018	0.0014	0.0008	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		0.0021	0.0049	0.0015	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		0.0044	0.0036	0.0015	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		0.0011	0.0013	0.0004	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		0.0015	0.0008	0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		0.0005	0.0006	0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		0.0006	0.0017	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS04	SS05	SS06	SS07	SS08
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-063	EM2319006-064	EM2319006-065	EM2319006-066	EM2319006-067
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	0.0039	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		0.0012	0.0106	0.0014	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		0.0007	0.0024	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.189	0.472	0.0326	0.0074	0.0063
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.162	0.408	0.0182	0.0074	0.0063
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.175	0.437	0.0297	0.0074	0.0063
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		126	107	99.2	104	103
13C8-PFOA	----	0.0002	%		92.8	102	99.7	105	100



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS10	SS11	MW01_0.08-0.18	MW01_3.4-3.5	MW02_0.08-0.18
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-069	EM2319006-070	EM2319006-072	EM2319006-078	EM2319006-081
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		7.2	4.7	4.5	24.4	5.7
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		0.0004	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0197	0.0004	0.0005	<0.0002	0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		0.0016	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.246	0.0296	0.0242	<0.0002	0.0934
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0182	0.0002	<0.0002	<0.0002	0.0004
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		0.0003	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		0.0003	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		0.0013	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		0.0006	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		0.0016	<0.0002	<0.0002	<0.0002	0.0013
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SS10	SS11	MW01_0.08-0.18	MW01_3.4-3.5	MW02_0.08-0.18
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-069	EM2319006-070	EM2319006-072	EM2319006-078	EM2319006-081
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.290	0.0302	0.0247	<0.0002	0.0953
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.266	0.0300	0.0247	<0.0002	0.0936
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.268	0.0300	0.0247	<0.0002	0.0936
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		110	107	102	116	116
13C8-PFOA	----	0.0002	%		97.5	105	106	102	98.5



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	MW02_1.3-1.4	MW02_2.7-2.8	MW03_1.8-1.9	MW03_3.4-3.5	FD02
Sampling date / time					19-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-083	EM2319006-085	EM2319006-092	EM2319006-095	EM2319006-099
					Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		30.5	13.9	35.2	14.4	3.9
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		0.0026	0.0016	<0.0002	<0.0002	0.0008
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		0.0053	0.0011	<0.0002	<0.0002	0.0011
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0308	0.0050	<0.0002	<0.0002	0.0096
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0007
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	0.0003	<0.0002	<0.0002	0.0540
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0004
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		0.0013	0.0008	<0.0002	<0.0002	0.0003
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		0.0083	0.0028	<0.0002	<0.0002	0.0020
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		0.0014	0.0002	<0.0002	<0.0002	0.0003
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		0.0006	0.0003	<0.0002	<0.0002	0.0007
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0005
Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0006
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	MW02_1.3-1.4	MW02_2.7-2.8	MW03_1.8-1.9	MW03_3.4-3.5	FD02
Sampling date / time					19-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	18-Oct-2023 00:00
Compound	CAS Number	LOR	Unit		EM2319006-083	EM2319006-085	EM2319006-092	EM2319006-095	EM2319006-099
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	0.0015
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	0.0120
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.0503	0.0121	<0.0002	<0.0002	0.0849
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0308	0.0053	<0.0002	<0.0002	0.0636
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0450	0.0110	<0.0002	<0.0002	0.0692
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		104	110	109	102	98.8
13C8-PFOA	----	0.0002	%		108	111	100.0	104	105



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	FD03	FD04	FD05	----	----
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	19-Oct-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EM2319006-100	EM2319006-101	EM2319006-104	-----	-----
					Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		4.9	2.7	4.8	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0002	<0.0002	0.0005	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0257	0.0158	0.150	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0007	0.0004	0.0004	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		0.0026	0.0005	0.0017	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	FD03	FD04	FD05	----	----
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	19-Oct-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EM2319006-100	EM2319006-101	EM2319006-104	-----	-----
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.0292	0.0167	0.153	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0259	0.0158	0.150	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0259	0.0158	0.150	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		99.2	107	105	----	----
13C8-PFOA	----	0.0002	%		102	110	104	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				FB01	RB01	FB02	RB02	----
Sampling date / time				18-Oct-2023 00:00	18-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	----
Compound	CAS Number	LOR	Unit	EM2319006-102	EM2319006-103	EM2319006-105	EM2319006-106	-----
				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	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FB01	RB01	FB02	RB02	----
Sampling date / time					18-Oct-2023 00:00	18-Oct-2023 00:00	19-Oct-2023 00:00	19-Oct-2023 00:00	----
Compound	CAS Number	LOR	Unit		EM2319006-102	EM2319006-103	EM2319006-105	EM2319006-106	-----
					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	%		107	108	111	114	----
13C8-PFOA	----	0.02	%		96.8	99.2	99.3	95.4	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Rebatch

Client / Client code: GHDSER

Project: MFS PORT ADELAIDE DSI

Project Manger: ANGUS ROBINSON

Date /time sample rec: 24/10/2023 13:00:00 PM

Date/time Instructions rec: 1/11/2023 12:34

Due date: Thursday, 9 November 2023

Due date surcharge: STANDARD

CS Contact: Peter Ravlic/RU

Additional Information:

Report receipients: ANGUS

R,GHD LABREPORTS

Environmental Division
Melbourne

Work Order Reference

EM2319557



Telephone : + 61-3-8549 9600

[illegible]

Ciara Barr

From: Angus Robinson <angus.robinson@ghd.com>
Sent: Wednesday, 1 November 2023 12:34 PM
To: Peter Ravlic
Cc: Tom Duncan
Subject: [EXTERNAL] - RE: RESULTS & EDD & INVOICE for ALS Workorder : EM2319006 | Your Reference: MFS PORT ADELAIDE DSI

CAUTION: This email originated from outside of ALS. Do not click links or open attachments unless you recognize the sender and are sure content is relevant to you.

Hi Peter,

Please also analyse BH07_PAVER for PFAS long suite standard LOR.

Thank you

Angus Robinson
BHSc, GDipEnvHlth
Senior Environmental Scientist

GHD

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Level 4 211 Victoria Square Adelaide SA 5000 Australia

D +61 8 8111 6688 M +61 431 177 498 E Angus.Robinson@ghd.com

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Please consider the environment before printing this email

From: angel-no-reply@alsglobal.com <angel-no-reply@alsglobal.com>
Sent: Tuesday, October 31, 2023 4:29 PM
To: Angus Robinson <angus.robinson@ghd.com>
Subject: RESULTS & EDD & INVOICE for ALS Workorder : EM2319006 | Your Reference: MFS PORT ADELAIDE DSI



Deliverables for ALS Workorder EM2319006



SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EM2319557

Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: angus.robinson@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: MFS PORT ADELAIDE DSI	Page	: 1 of 2
Order number	: ----	Quote number	: EB2020GHDSE0038 (EN/000)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: Nicole Peachey, Terrence Wilson		

Dates

Date Samples Received	: 24-Oct-2023 12:30	Issue Date	: 01-Nov-2023
Client Requested Due Date	: 09-Nov-2023	Scheduled Reporting Date	: 09-Nov-2023

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **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.**
- This is a rebatch of EM2319006.
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

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

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EM2319557-001	18-Oct-2023 00:00	BH07_PAVER	✓	✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)

Email accountspayableAU@ghd.com

Accounts Payable Australia

- A4 - AU Tax Invoice (INV)

Email accountspayableAU@ghd.com

ANGUS ROBINSON

- *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)
- A4 - AU Tax Invoice (INV)
- Chain of Custody (CoC) (COC)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)
- Electronic SRN for ESDat (ESRN_ESDAT)

Email angus.robinson@ghd.com
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Email angus.robinson@ghd.com

GHD LAB REPORTS

- *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)
- EDI Format - ESDAT (ESDAT)
- Electronic SRN for ESDat (ESRN_ESDAT)

Email ghdlabreports@ghd.com
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QUALITY CONTROL REPORT

Work Order	: EM2319557	Page	: 1 of 7
Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: MFS PORT ADELAIDE DSI	Date Samples Received	: 24-Oct-2023
Order number	: ----	Date Analysis Commenced	: 02-Nov-2023
C-O-C number	: ----	Issue Date	: 06-Nov-2023
Sampler	: Nicole Peachey, Terrence Wilson		
Site	:		
Quote number	: EN/000		
No. of samples received	: 1		
No. of samples analysed	: 1		



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
Xing Lin	Senior Organic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC



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.

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5400775)									
EM2319541-001	Anonymous	EA055: Moisture Content	----	0.1	%	17.3	17.4	0.0	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5399197)									
EM2318930-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2319478-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0011	0.0012	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5399197)									
EM2318930-005	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit		

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5399197) - continued									
EM2318930-005	Anonymous	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EM2319478-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
		EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5399197)							
EM2318930-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2319478-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5399197)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5399197) - continued									
EM2318930-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2319478-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 5399197)									
EM2318930-005	Anonymous	EP231X: Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2319478-001	Anonymous	EP231X: Sum of PFAS	----	0.0002	mg/kg	0.0011	0.0012	8.7	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0011	0.0012	8.7	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0011	0.0012	8.7	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	Spike Recovery (%)	Acceptable Limits (%)		
Result	Concentration	LCS	Low	High	
<0.0002	0.00111 mg/kg	88.8	72.0	128	
<0.0002	0.00118 mg/kg	74.1	73.0	123	
<0.0002	0.00114 mg/kg	89.6	67.0	130	
<0.0002	0.00119 mg/kg	113	70.0	132	
<0.0002	0.00116 mg/kg	92.9	68.0	136	
<0.0002	0.00121 mg/kg	93.8	59.0	134	
<0.001	0.00625 mg/kg	79.8	71.0	135	
<0.0002	0.00125 mg/kg	94.6	69.0	132	
<0.0002	0.00125 mg/kg	89.6	70.0	132	
<0.0002	0.00125 mg/kg	97.4	71.0	131	
<0.0002	0.00125 mg/kg	92.9	69.0	133	
<0.0002	0.00125 mg/kg	107	72.0	129	
<0.0002	0.00125 mg/kg	96.8	69.0	133	
<0.0002	0.00125 mg/kg	98.9	64.0	136	
<0.0002	0.00125 mg/kg	86.8	69.0	135	
<0.0002	0.00125 mg/kg	77.3	66.0	139	
<0.0005	0.00312 mg/kg	96.7	69.0	133	
<0.0002	0.00125 mg/kg	99.3	67.0	137	
<0.0005	0.00312 mg/kg	108	70.0	130	
<0.0005	0.00312 mg/kg	80.6	70.0	130	
<0.0005	0.00312 mg/kg	118	70.0	130	
<0.0005	0.00312 mg/kg	97.3	70.0	130	
<0.0002	0.00125 mg/kg	79.1	63.0	144	
<0.0002	0.00125 mg/kg	79.1	61.0	139	



Sub-Matrix: SOIL				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				
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5399197) - continued								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	97.5	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	96.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	99.1	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	80.5	70.0	130
EP231P: PFAS Sums (QCLot: 5399197)								
EP231X: Sum of PFAS	----	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----

Matrix Spike (MS) Report

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

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5399197)							
EM2319137-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	105	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00118 mg/kg	74.9	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	# 42.6	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00119 mg/kg	105	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00121 mg/kg	# 41.7	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5399197)							
EM2319137-005	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	76.6	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	# 67.9	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	79.5	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	73.7	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	85.2	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	97.4	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	86.7	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	95.1	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	92.3	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.00125 mg/kg	138	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	90.5	69.0	133



Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5399197)							
EM2319137-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	82.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	110	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	82.3	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	97.9	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	76.7	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	67.6	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	68.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5399197)							
EM2319137-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	85.9	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	100	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	116	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	# Not Determined	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM2319557	Page	: 1 of 5
Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Telephone	: +6138549 9645
Project	: MFS PORT ADELAIDE DSI	Date Samples Received	: 24-Oct-2023
Site	:	Issue Date	: 06-Nov-2023
Sampler	: Nicole Peachey, Terrence Wilson	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EM2319137--005	Anonymous	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	42.6 %	67.0-130%	Recovery less than lower data quality objective
EP231A: Perfluoroalkyl Sulfonic Acids	EM2319137--005	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EM2319137--005	Anonymous	Perfluorodecane sulfonic acid (PFDS)	335-77-3	41.7 %	59.0-134%	Recovery less than lower data quality objective
EP231B: Perfluoroalkyl Carboxylic Acids	EM2319137--005	Anonymous	Perfluoropentanoic acid (PFPeA)	2706-90-3	67.9 %	69.0-132%	Recovery less than lower data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content (Dried @ 105-110°C)						
HDPE Soil Jar BH07_PAVER	----	----	----	02-Nov-2023	01-Nov-2023	1

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

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

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) BH07_PAVER	18-Oct-2023	----	----	----	02-Nov-2023	01-Nov-2023	✖
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) BH07_PAVER	18-Oct-2023	02-Nov-2023	15-Apr-2024	✔	06-Nov-2023	12-Dec-2023	✔



Matrix: SOIL

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 Soil Jar (EP231X) BH07_PAVER	18-Oct-2023	02-Nov-2023	15-Apr-2024	✔	06-Nov-2023	12-Dec-2023	✔
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) BH07_PAVER	18-Oct-2023	02-Nov-2023	15-Apr-2024	✔	06-Nov-2023	12-Dec-2023	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) BH07_PAVER	18-Oct-2023	02-Nov-2023	15-Apr-2024	✔	06-Nov-2023	12-Dec-2023	✔
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) BH07_PAVER	18-Oct-2023	02-Nov-2023	15-Apr-2024	✔	06-Nov-2023	12-Dec-2023	✔



Quality Control Parameter Frequency Compliance

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

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

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	1	6	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	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
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.



CERTIFICATE OF ANALYSIS

Work Order : EM2319557
Client : GHD PTY LTD
Contact : ANGUS ROBINSON
Address : Level 4, 211 VICTORIA SQUARE
ADELAIDE SA, AUSTRALIA 5000
Telephone : ----
Project : MFS PORT ADELAIDE DSI
Order number : ----
C-O-C number : ----
Sampler : Nicole Peachey, Terrence Wilson
Site :
Quote number : EN/000
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 5
Laboratory : Environmental Division Melbourne
Contact : Peter Ravlic
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +6138549 9645
Date Samples Received : 24-Oct-2023 12:30
Date Analysis Commenced : 02-Nov-2023
Issue Date : 06-Nov-2023 17:23



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Xing Lin	Senior Organic Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC



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 Contract for details.

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP231X: Poor matrix spike recovery for sample EM2319137-005 due to sample matrix interference.
- This is a rebatch of EM2319006.
- 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: SOIL (Matrix: SOIL)				Sample ID	BH07_PAVER	----	----	----	----
Sampling date / time					18-Oct-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2319557-001	-----	-----	-----	-----
				Result	----	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		3.1	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		0.0052	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		0.0049	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0388	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		0.0025	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0834	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0004	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		0.0014	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		0.0089	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		0.0010	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		0.0017	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		0.0009	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	----	----	----	----



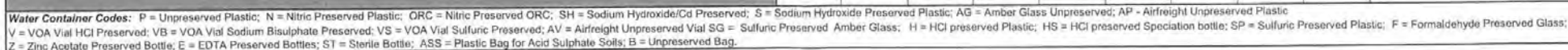
Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH07_PAVER	----	----	----	----
Sampling date / time					18-Oct-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2319557-001	-----	-----	-----	-----
				Result		----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		0.0007	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		0.0058	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.156	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.122	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.141	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		103	----	----	----	----
13C8-PFOA	----	0.0002	%		70.8	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133





SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EM2319459

Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Contact	: Kieren Burns
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: angus.robinson@ghd.com	E-mail	: kieren.burns@alsglobal.com
Telephone	: ----	Telephone	: +61881625130
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: 12616804	Page	: 1 of 2
Order number	: ----	Quote number	: EM2023GHDSE0022 (EM23GHDSE0022)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	:		

Dates

Date Samples Received	: 31-Oct-2023 11:35	Issue Date	: 31-Oct-2023
Client Requested Due Date	: 08-Nov-2023	Scheduled Reporting Date	: 08-Nov-2023

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 7.0°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 5 / 5

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **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.



QUALITY CONTROL REPORT

Work Order	: EM2319459	Page	: 1 of 7
Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: ANGUS ROBINSON	Contact	: Kieren Burns
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +61881625130
Project	: 12616804	Date Samples Received	: 31-Oct-2023
Order number	: ----	Date Analysis Commenced	: 31-Oct-2023
C-O-C number	: ----	Issue Date	: 02-Nov-2023
Sampler	: ----		
Site	: ----		
Quote number	: EM23GHDSE0022		
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, 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
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC



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.

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 (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5397600)									
EM2319355-001	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	0.16	0.16	0.0	0% - 50%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.06	0.06	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: 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
EM2319357-003	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	1.00	1.01	0.0	0% - 20%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.57	0.62	7.1	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.17	0.18	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.14	0.14	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.05	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: 5397600)									
EM2319355-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (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



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: 5397600) - continued									
EM2319357-003	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.06	0.05	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.20	0.20	0.0	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.04	0.04	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: 5397600)									
EM2319355-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EM2319357-003	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: 5397600)									
EM2319355-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Page : 4 of 7
 Work Order : EM2319459
 Client : GHD PTY LTD
 Project : 12616804



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: 5397600) - continued									
EM2319355-001	Anonymous	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
EM2319357-003	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: 5397600)									
EM2319355-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.22	0.22	0.0	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.22	0.22	0.0	0% - 20%
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	0.22	0.22	0.0	0% - 20%
EM2319357-003	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	2.29	2.36	3.0	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.57	1.63	3.8	0% - 20%
		EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	2.10	2.16	2.8	0% - 20%

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	
Result					
<0.02	0.222 µg/L	81.1	72.0	130	
<0.02	0.235 µg/L	86.2	71.0	127	
<0.01	0.228 µg/L	86.5	68.0	131	
<0.02	0.238 µg/L	95.9	69.0	134	
<0.01	0.232 µg/L	83.8	65.0	140	
<0.02	0.241 µg/L	88.5	53.0	142	
<0.1	1.25 µg/L	84.5	73.0	129	
<0.02	0.25 µg/L	91.9	72.0	129	
<0.02	0.25 µg/L	92.8	72.0	129	
<0.02	0.25 µg/L	88.3	72.0	130	
<0.01	0.25 µg/L	85.9	71.0	133	
<0.02	0.25 µg/L	89.7	69.0	130	
<0.02	0.25 µg/L	89.8	71.0	129	
<0.02	0.25 µg/L	92.3	69.0	133	
<0.02	0.25 µg/L	90.8	72.0	134	
<0.02	0.25 µg/L	83.2	65.0	144	
<0.05	0.625 µg/L	85.8	71.0	132	
<0.02	0.25 µg/L	92.7	67.0	137	
<0.05	0.625 µg/L	89.9	68.0	141	
<0.05	0.625 µg/L	87.3	70.0	130	
<0.05	0.625 µg/L	88.5	70.0	130	
<0.05	0.625 µg/L	92.8	70.0	130	
<0.02	0.25 µg/L	89.3	65.0	136	
<0.02	0.25 µg/L	79.4	61.0	135	

Matrix Spike (MS) Report

Sub-Matrix: WATER

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	Spike Recovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5397600)							
EM2319355-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.222 µg/L	95.4	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.235 µg/L	91.0	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.228 µg/L	92.8	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.238 µg/L	110	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.232 µg/L	83.5	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.241 µg/L	72.6	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5397600)							
EM2319355-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	74.7	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	93.0	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	96.2	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	91.8	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	89.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	89.5	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	79.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	83.0	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	77.9	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	77.2	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTTeDA)	376-06-7	0.625 µg/L	86.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5397600)							



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: 5397600) - continued							
EM2319355-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	84.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	83.4	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	70.7	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	84.2	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	84.5	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	83.5	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	81.1	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5397600)							
EM2319355-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.234 µg/L	98.2	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.238 µg/L	100	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.24 µg/L	91.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.242 µg/L	# 61.6	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order : EM2319459

Page : 1 of 5

Client : GHD PTY LTD
Contact : ANGUS ROBINSON
Project : 12616804
Site : ----
Sampler : ----
Order number : ----

Laboratory : Environmental Division Melbourne
Telephone : +61881625130
Date Samples Received : 31-Oct-2023
Issue Date : 02-Nov-2023
No. of samples received : 5
No. of samples analysed : 5

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

- **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							
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2319355--001	Anonymous	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	61.6 %	70.0-130%	Recovery less than lower data quality objective

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	
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) MW01, MW02, R01	QC1, MW03,	26-Oct-2023	01-Nov-2023	23-Apr-2024	✓	02-Nov-2023	23-Apr-2024	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) MW01, MW02, R01	QC1, MW03,	26-Oct-2023	01-Nov-2023	23-Apr-2024	✓	02-Nov-2023	23-Apr-2024	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) MW01, MW02, R01	QC1, MW03,	26-Oct-2023	01-Nov-2023	23-Apr-2024	✓	02-Nov-2023	23-Apr-2024	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) MW01, MW02, R01	QC1, MW03,	26-Oct-2023	01-Nov-2023	23-Apr-2024	✓	02-Nov-2023	23-Apr-2024	✓

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)		26-Oct-2023	01-Nov-2023	23-Apr-2024	✓	02-Nov-2023	23-Apr-2024	✓
MW01,	QC1,							
MW02,	MW03,							
R01								



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)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
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.



CERTIFICATE OF ANALYSIS

Work Order : EM2319459
Client : GHD PTY LTD
Contact : ANGUS ROBINSON
Address : Level 4, 211 VICTORIA SQUARE
ADELAIDE SA, AUSTRALIA 5000
Telephone : ----
Project : 12616804
Order number : ----
C-O-C number : ----
Sampler : ----
Site : ----
Quote number : EM23GHDSER0022
No. of samples received : 5
No. of samples analysed : 5

Page : 1 of 5
Laboratory : Environmental Division Melbourne
Contact : Kieren Burns
Address : 4 Westall Rd Springvale VIC Australia 3171
Telephone : +61881625130
Date Samples Received : 31-Oct-2023 11:35
Date Analysis Commenced : 31-Oct-2023
Issue Date : 02-Nov-2023 12:58



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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC



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 Contract for details.

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

LOR = Limit of reporting

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

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231X: Poor matrix spike recovery for sample EM2319355-001 due to sample matrix interference.
- 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: WATER
 (Matrix: WATER)

Sample ID

				MW01	QC1	MW02	MW03	R01
Sampling date / time				26-Oct-2023 00:00	26-Oct-2023 00:00	26-Oct-2023 00:00	26-Oct-2023 00:00	26-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EM2319459-001	EM2319459-002	EM2319459-003	EM2319459-004	EM2319459-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.40	0.46	1.68	0.14	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.22	0.21	0.94	0.03	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	1.44	1.38	4.88	0.03	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.18	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.02	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	0.3	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.20	0.20	0.74	0.03	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.49	0.48	2.67	0.11	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.07	0.07	0.24	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.11	0.10	0.24	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				MW01	QC1	MW02	MW03	R01
Sampling date / time				26-Oct-2023 00:00	26-Oct-2023 00:00	26-Oct-2023 00:00	26-Oct-2023 00:00	26-Oct-2023 00:00
Compound	CAS Number	LOR	Unit	EM2319459-001	EM2319459-002	EM2319459-003	EM2319459-004	EM2319459-005
				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	0.08	<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	2.95	2.91	12.1	0.34	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	1.46	1.39	5.06	0.03	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	2.73	2.70	11.0	0.31	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	105	108	112	111	98.8
13C8-PFOA	----	0.02	%	103	102	102	102	102



Surrogate Control Limits

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Report: 1038561
26/10 BF

325



CHAIN OF CUSTODY

ALS Laboratory:
please tick →

CLIENT: GHD	TURNAROUND REQUIREMENTS : ☒ Standard TAT (List due date): (Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	FOR LABORATORY USE ONLY. (Circle)	
OFFICE: Adelaide	ALS QUOTE:	COC SEQUENCE NUMBER (Circle)	Custody Seal intact? Yes No N/A
PROJECT: MFS CAMDEN PARK DSI	ORDER NO.: 12616802	COC: 1 2 3 4 5 6 7	Free ice / frozen ice bricks present upon receipt? Yes No N/A
PROJECT MANAGER: Angus Robinson	CONTACT PH: 0431 177 498	OF: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
SAMPLER: TW (Terrence Wilson)	SAMPLER MOBILE: 0467 034 756	RELINQUISHED BY: Terrence Wilson	RECEIVED BY: Kieren Burns
COC emailed to ALS? YES	EDD FORMAT (or default): Esdat	DATE/TIME: 17 October 2023; 15:00	DATE/TIME: 17 October 2023; 15:00
Email Reports to: Angus.Robinson@ghd.com; Terrence.Wilson@ghd.com; Ben.Petticrew@ghd.com; GHDLabReports@ghd.com			
Email Invoice to: Angus.Robinson@ghd.com; accountspayableAU@ghd.com			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).										Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS (Long Suite) - Standard LOR	HOLD								FORWARD TO EUROFINS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
97	FD01	18/10/2023	S	P	1		X									
98	FS01	18/10/2023	S	P	1		X									
99	FD02	18/10/2023	S	P	1	X										
-	FS02	18/10/2023	S	P	1	X									X	PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
100	FD03	18/10/2023	S	P	1	X										
-	FS03	18/10/2023	S	P	1	X									X	PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
101	FD04	18/10/2023	S	P	1	X										
-	FS04	18/10/2023	S	P	1	X									X	PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
102	FB01	18/10/2023	W	P	1	X										
103	RB01	18/10/2023	W	P	1	X										
104	FD05	19/10/2023	S	P	1	X										
-	FS05	19/10/2023	S	P	1	X									X	PLEASE FORWARD ON TO EUROFINS FOR ANALYSIS
TOTAL					12											

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag

RELINQUISHED BY SR (ALS), 25/10/2023

DATE: 26/10/23

TIME: 9am

COURIER:

TEMPERATURE 10.3

ATTEMPT TO CHILL: YES

NO

3105

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rourke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd SA
Contact name:	Angus Robinson
Project name:	MFS CAMDEN PARK DSI
Project ID:	12616802
Turnaround time:	5 Day
Date/Time received	Oct 26, 2023 9:00 AM
Eurofins reference	1038561

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:

Amy Meunier on phone : or by email: AmyMeunier@eurofins.com

Results will be delivered electronically via email to Angus Robinson - angus.robinson@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd SA email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

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46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

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35 O'Rorke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Company Name:

Address:

Project Name:

Project ID:

GHD Pty Ltd SA

GPO Box 2052
Adelaide
SA 5001

MFS Port Adelaide DSI

12616804

Order No.:

Report #:

Phone:

Fax:

12616802

1038561

08 8111 6600

08 8111 6699

Received:

Due:

Priority:

Contact Name:

Oct 26, 2023 9:00 AM

Nov 2, 2023

5 Day

Angus Robinson

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X	X
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	FS02	Oct 18, 2023		Soil	M23-Oc0063790	X	X
2	FS03	Oct 18, 2023		Soil	M23-Oc0063791	X	X
3	FS04	Oct 18, 2023		Soil	M23-Oc0063792	X	X
4	FS05	Oct 19, 2023		Soil	M23-Oc0063793	X	X
Test Counts						4	4

GHD Pty Ltd
GPO Box 2052
Adelaide
SA 5001



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, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: Angus Robinson

Report 1038561-S-V2
Project name MFS Port Adelaide DSI
Project ID 12616804
Received Date Oct 26, 2023

Client Sample ID			FS02	FS03	FS04	FS05
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M23- Oc0063790	M23- Oc0063791	M23- Oc0063792	M23- Oc0063793
Date Sampled			Oct 18, 2023	Oct 18, 2023	Oct 18, 2023	Oct 19, 2023
Test/Reference	LOR	Unit				
Sample Properties						
% Moisture	1	%	3.4	5.1	2.5	5.3
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	14	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	83	90	90	91
13C5-PFPeA (surr.)	1	%	87	100	96	101
13C5-PFHxA (surr.)	1	%	95	104	96	103
13C4-PFHpA (surr.)	1	%	109	91	88	96
13C8-PFOA (surr.)	1	%	97	85	91	100
13C5-PFNA (surr.)	1	%	87	97	94	101
13C6-PFDA (surr.)	1	%	89	103	102	111
13C2-PFUnDA (surr.)	1	%	81	101	95	106
13C2-PFDoDA (surr.)	1	%	82	105	100	107
13C2-PFTeDA (surr.)	1	%	54	70	68	73
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10

Client Sample ID Sample Matrix Eurofins Sample No. Date Sampled Test/Reference	LOR	Unit	FS02 Soil M23- Oc0063790 Oct 18, 2023	FS03 Soil M23- Oc0063791 Oct 18, 2023	FS04 Soil M23- Oc0063792 Oct 18, 2023	FS05 Soil M23- Oc0063793 Oct 19, 2023
Perfluoroalkyl sulfonamido substances						
13C8-FOSA (surr.)	1	%	73	90	87	91
D3-N-MeFOSA (surr.)	1	%	95	102	106	109
D5-N-EtFOSA (surr.)	1	%	95	102	103	108
D7-N-MeFOSE (surr.)	1	%	87	92	92	99
D9-N-EtFOSE (surr.)	1	%	91	93	97	97
D5-N-EtFOSAA (surr.)	1	%	59	89	88	94
D3-N-MeFOSAA (surr.)	1	%	70	100	98	102
Perfluoroalkyl sulfonic acids (PFASs)						
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	^{N09} 6.6	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	^{N09} 33	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	^{N09} 65	^{N09} 27	^{N09} 22	^{N09} 180
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	99	96	95	103
18O2-PFHxS (surr.)	1	%	91	95	95	105
13C8-PFOS (surr.)	1	%	83	92	91	87
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	99	80	76	83
13C2-6:2 FTSA (surr.)	1	%	190	66	78	91
13C2-8:2 FTSA (surr.)	1	%	55	94	87	96
13C2-10:2 FTSA (surr.)	1	%	65	100	99	98
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	98	27	22	180
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	65	27	22	180
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	98	27	22	180
Sum of WA DWER PFAS (n=10)*	10	ug/kg	118.6	27	22	180
Sum of PFASs (n=30)*	50	ug/kg	118.6	< 50	< 50	180

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
% Moisture	Melbourne	Oct 26, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Oct 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Oct 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Oct 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Oct 27, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Oct 26, 2023	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			



Melbourne 6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	Geelong 19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	Sydney 179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Canberra Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	Brisbane 1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	Newcastle 1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Perth 46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

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Company Name: GHD Pty Ltd SA
Address: GPO Box 2052
Adelaide
SA 5001

Project Name: MFS Port Adelaide DSI
Project ID: 12616804

Order No.: 12616802
Report #: 1038561
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Oct 26, 2023 9:00 AM
Due: Nov 2, 2023
Priority: 5 Day
Contact Name: Angus Robinson

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Moisture Set	Per- and Polyfluoroalkyl Substances (PFASs)
						X	X
Melbourne Laboratory - NATA # 1261 Site # 1254							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	FS02	Oct 18, 2023		Soil	M23-Oc0063790	X	X
2	FS03	Oct 18, 2023		Soil	M23-Oc0063791	X	X
3	FS04	Oct 18, 2023		Soil	M23-Oc0063792	X	X
4	FS05	Oct 19, 2023		Soil	M23-Oc0063793	X	X
Test Counts						4	4

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry weight basis unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion unless otherwise stated.
- For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
- Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
- Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
- SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
- This report replaces any interim results previously issued.

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

Holding times apply from the date of sampling; therefore, compliance with 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, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

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%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported, have been reviewed, and no data was affected.

QC Data General Comments

- Where a result is reported as 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.
- 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 are not data from your samples.
- 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.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 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							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	73			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	57			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	75			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	69			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	78			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	74			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	71			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	65			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	72			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	%	56			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	64			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	78			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	76			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	75			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)			%	79			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)			%	68			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	73			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	73			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)									
Perfluorobutanesulfonic acid (PFBS)			%	62			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	76			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	68			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	57			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	73			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	71			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	70			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	62			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	65			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)			%	68			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	63			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	67			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)									
				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Oc0063819	NCP	%	74			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Oc0063819	NCP	%	58			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Oc0063819	NCP	%	80			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Oc0063819	NCP	%	67			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Oc0063819	NCP	%	82			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Oc0063819	NCP	%	77			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Oc0063819	NCP	%	77			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Oc0063819	NCP	%	75			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Oc0063819	NCP	%	77			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Oc0063819	NCP	%	76			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Oc0063819	NCP	%	69			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances									
				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Oc0063819	NCP	%	83			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Oc0063819	NCP	%	81			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Oc0063819	NCP	%	77			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Oc0063819	NCP	%	73			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Oc0063819	NCP	%	69			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Oc0063819	NCP	%	68			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Oc0063819	NCP	%	76			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFASs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Oc0063819	NCP	%	66			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Oc0063842	NCP	%	76			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Oc0063819	NCP	%	68			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Oc0063819	NCP	%	57			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Oc0063819	NCP	%	79			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Oc0063819	NCP	%	119			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Oc0063842	NCP	%	70			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Oc0063819	NCP	%	109			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-Oc0063819	NCP	%	62			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Oc0063819	NCP	%	70			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Oc0063819	NCP	%	75			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Oc0063819	NCP	%	66			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	M23-Oc0063737	NCP	%	28	28	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTriDA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Oc0063818	NCP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Oc0063818	NCP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M23-Oc0063818	NCP	ug/kg	8.8	6.7	27	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M23-Oc0063818	NCP	ug/kg	27	19	33	30%	Fail
Perfluoroheptanesulfonic acid (PFHpS)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M23-Oc0060304	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<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)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Oc0063818	NCP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Oc0063818	NCP	ug/kg	< 5	< 5	<1	30%	Pass

Comments

This report has been revised (V2) to correct project name MFS CAMDEN PARK DSI 12616802 to MFS Port Adelaide DSI 12616804, per client request.

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).
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Amy Meunier	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS



Glenn Jackson
Managing Director

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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RELINQUISHED BY SR (ALS), 31/10/2023

411

CHAIN OF CUSTODY				ADELAIDE U3/1 Burma Road Pooraka SA 5095 Ph: 08 8162 5130 E: adelaide@alsglobal.com				MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com				NEWCASTLE 5 Rose Gum Road Warahook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com				SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com			
Brisbane 32 Sheno Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com				Melbourne 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com				Nowra 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com				Towansville 15 Desma Court Bohle QLD 4818 Ph: 07 4661 6000 E: towansville.environmental@alsglobal.com							
GLADSTONE 46 Cattenomah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com				Mudgee 27 Sydney Road Mudgee NSW 2850 Ph: 02 6332 6735 E: mudgee.mel@alsglobal.com				Perth 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com				Wollongong 59 Kenny Street Wollongong NSW 2500 Ph: 02 4226 3125 E: portkierling@alsglobal.com							
CLIENT: GHD				TURNAROUND REQUIREMENTS: ☒ Standard TAT (List due date):				FOR LABORATORY USE ONLY (Circle)											
OFFICE:				(Standard TAT may be longer for some tests e.g. Ultra Trace Organics)				Custody Seal Intact? Yes No N/A											
PROJECT:				ALS QUOTE: E123GHDSE R0022				Free ice / frozen ice bricks present upon receipt? Yes No N/A											
PROJECT MANAGER: Angus Robinson				ORDER NO.:				Random Sample Temperature on Receipt: °C											
SAMPLER: Angus Robinson				RECEIVED BY: Josh Anderson				Other comment:											
COC emailed to ALS? (YES / NO)				DATE/TIME: 27/10/23															
Email Reports to: GHDLabReports@ghd.com, Angus.Robinson@ghd.com																			
Email Invoice to:																			
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:																			
ALS USE		SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)		CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).						Additional Information							
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	PFAS	LONG SUITE												
	MW01	26/10/23	W	2x Plastic PFAS CONTAINERS	2	X													
	QC1				2	X													
	QC1A				2	X													
	MW02				2	X													
	MW03				2	X													
	ROI																		
DATE: 1/11/23 TIME: 9am COURIER: TEMPERATURE 9.6 ATTEMPT TO CHILL: YES NO 5.25																			

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

Eurofins ARL Pty Ltd

ABN: 91 05 0159 898

Perth
46-48 Banksia Road Welshpool WA 6106 Tel: +61 8 6253 4444 NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd

NZBN: 9429046024954

Auckland	Christchurch	Tauranga
35 O'Rourke Road Penrose, Auckland 1061 Tel: +64 9 526 4551 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 Tel: +64 9 525 0568 IANZ# 1402

Sample Receipt Advice

Company name:	GHD Pty Ltd SA
Contact name:	- ALL SRAs/COCs/Reports
Project name:	Not provided
Project ID:	12616804
Turnaround time:	5 Day
Date/Time received	Nov 1, 2023 9:00 AM
Eurofins reference	1040229

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:

Amy Meunier on phone : or by email: AmyMeunier@eurofins.com

Results will be delivered electronically via email to - ALL SRAs/COCs/Reports - GHDLabReports@ghd.com.

Note: A copy of these results will also be delivered to the general GHD Pty Ltd SA email address.



web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd

ABN: 50 005 085 521

Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle
6 Monterey Road Dandenong South VIC 3175 Tel: +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 Tel: +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 Tel: +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 Tel: +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 Tel: +61 7 3902 4600 NATA# 1261 Site# 20794	1/2 Frost Drive Mayfield West NSW 2304 Tel: +61 2 4968 8448 NATA# 1261 Site# 25079 & 25289

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Eurofins Environment Testing NZ Ltd

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Company Name:	GHD Pty Ltd SA	Order No.:		Received:	Nov 1, 2023 9:00 AM
Address:	GPO Box 2052 Adelaide SA 5001	Report #:	1040229	Due:	Nov 9, 2023
		Phone:	08 8111 6600	Priority:	5 Day
		Fax:	08 8111 6699	Contact Name:	- ALL SRAs/COCs/Reports
Project Name:					
Project ID:	12616804				

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail						Per- and Polyfluoroalkyl Substances (PFASs)
Melbourne Laboratory - NATA # 1261 Site # 1254						X
External Laboratory						
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID	
1	QC1A	Oct 26, 2023		Water	M23-No0001980	X
Test Counts						1

GHD Pty Ltd
GPO Box 2052
Adelaide
SA 5001



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, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: **Angus Robinson**

Report **1040229-W**

Project name

Project ID **12616804**

Received Date **Nov 01, 2023**

Client Sample ID			QC1A
Sample Matrix			Water
Eurofins Sample No.			M23- No0001980
Date Sampled			Oct 26, 2023
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	0.09
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	0.15
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	0.43
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	^{N09} 0.06
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	^{N09} 0.10
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA) ^{N15}	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	64
13C5-PFPeA (surr.)	1	%	78
13C5-PFHxA (surr.)	1	%	95
13C4-PFHpA (surr.)	1	%	100
13C8-PFOA (surr.)	1	%	97
13C5-PFNA (surr.)	1	%	104
13C6-PFDA (surr.)	1	%	96
13C2-PFUnDA (surr.)	1	%	66
13C2-PFDoDA (surr.)	1	%	77
13C2-PFTeDA (surr.)	1	%	48
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	58
D3-N-MeFOSA (surr.)	1	%	49

Client Sample ID			QC1A
Sample Matrix			Water
Eurofins Sample No.			M23- No0001980
Date Sampled			Oct 26, 2023
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
D5-N-EtFOSA (surr.)	1	%	57
D7-N-MeFOSE (surr.)	1	%	59
D9-N-EtFOSE (surr.)	1	%	67
D5-N-EtFOSAA (surr.)	1	%	57
D3-N-MeFOSAA (surr.)	1	%	60
Perfluoroalkyl sulfonic acids (PFASs)			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	^{N09} 0.43
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	0.33
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	^{N09} 0.26
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	^{N09} 1.2
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	^{N09} 0.02
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	^{N09} 0.01
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	102
18O2-PFHxS (surr.)	1	%	98
13C8-PFOS (surr.)	1	%	114
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
13C2-4:2 FTSA (surr.)	1	%	113
13C2-6:2 FTSA (surr.)	1	%	107
13C2-8:2 FTSA (surr.)	1	%	153
13C2-10:2 FTSA (surr.)	1	%	59
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	1.21
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.11
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	1.31
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	2.47
Sum of PFASs (n=30)*	0.1	ug/L	3.08

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
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Nov 03, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Nov 03, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Nov 03, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Nov 03, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Nov 01, 2023	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			



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Company Name: GHD Pty Ltd SA
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Project Name:
Project ID: 12616804

Order No.:
Report #: 1040229
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: Nov 1, 2023 9:00 AM
Due: Nov 9, 2023
Priority: 5 Day
Contact Name: - ALL SRAs/COCs/Reports

Eurofins Analytical Services Manager : Amy Meunier

Sample Detail

Per- and Polyfluoroalkyl Substances (PFASs)

Melbourne Laboratory - NATA # 1261 Site # 1254

X

External Laboratory

No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID	
1	QC1A	Oct 26, 2023		Water	M23-No0001980	X
Test Counts						1

Internal Quality Control Review and Glossary

General

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

Holding Times

Please refer to the '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 before sample receipt deadlines as stated on the SRA.

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

Holding times apply from the date of sampling; therefore, compliance with 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, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	µg/L: micrograms per litre
ppm: parts per million	ppb: parts per billion	%: Percentage
org/100 mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100 mL: Most Probable Number of organisms per 100 millilitres
CFU: Colony forming unit		

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - 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.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (<i>bis</i> -tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

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%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%

PFAS field samples that contain surrogate recoveries above the QC limit designated in QSM 5.4, where no positive PFAS results have been reported, have been reviewed, and no data was affected.

QC Data General Comments

- Where a result is reported as 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.
- 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 are not data from your samples.
- 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.
- Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
- For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
- 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							
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 FTSA's)							
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							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	82			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	88			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	81			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	79			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	81			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	96			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	86			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	88			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	89			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	%	59			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	92			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	91			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	84			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	104			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)			%	86			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	81			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	88			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)									
Perfluorobutanesulfonic acid (PFBS)			%	87			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	86			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	106			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	76			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	95			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	97			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	86			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	71			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	82			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)			%	87			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	89			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	85			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)									
				Result 1					
Perfluorobutanoic acid (PFBA)	M23-No0002014	NCP	%	101			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-No0002014	NCP	%	93			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-No0002014	NCP	%	95			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-No0002014	NCP	%	92			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-No0002014	NCP	%	93			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-No0002014	NCP	%	102			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-No0002014	NCP	%	93			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-No0002014	NCP	%	94			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-No0002014	NCP	%	93			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-No0002014	NCP	%	54			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-No0002014	NCP	%	91			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances									
				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-No0002014	NCP	%	92			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-No0002014	NCP	%	90			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-No0002014	NCP	%	106			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-No0002014	NCP	%	93			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-No0002014	NCP	%	95			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-No0002014	NCP	%	85			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-No0002014	NCP	%	91			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-No0002014	NCP	%	93			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-No0002014	NCP	%	79			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-No0002014	NCP	%	95			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-No0002014	NCP	%	82			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-No0010551	NCP	%	92			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-No0002014	NCP	%	87			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-No0002014	NCP	%	80			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-No0002014	NCP	%	61			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M23-No0002014	NCP	%	90			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-No0002014	NCP	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-No0002014	NCP	%	98			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-No0002014	NCP	%	88			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M23-No0010550	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M23-No0001563	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)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-No0001563	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-No0001563	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-No0001563	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:

Amy Meunier	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS



Glenn Jackson
Managing Director

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 G

Tabulated Analytical Reports



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					Misc.	Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids								PFAS - Perfluoroalkyl Car					
					% Moisture _	Moisture (%)	Perfluoropropanesulfonic acid (PFPrS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	
EQL					1	0.1	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
PFAS NEMP 2.0 2020 Ecological direct exposure												1						10		
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites												0.14 ^{#1}								
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)										2		2						20		
SA MFS Site Specific Criteria - Metropolitan (Staffed)																		50		
Location Code	Date	Field ID	Lab Report Number	Depth																
BH01	18 Oct 2023	BH01 0.08-0.12	EM2319006	0.08 - 0.12	-	4.2	-	<0.0002	<0.0002	0.0007	<0.0002	0.0079	0.0021	<0.001	0.0002	0.0003	<0.0002	<0.0002	<0.0002	
		BH01 1.4-1.5	EM2319006	1.4 - 1.5	-	31.4	-	0.0022	0.0015	0.0062	<0.0002	<0.0002	<0.0002	<0.001	0.0018	0.0071	0.0007	0.0003	<0.0002	
BH02	18 Oct 2023	BH02 0.3-0.4	EM2319006	0.3 - 0.4	-	5.3	-	<0.0002	<0.0002	0.0003	<0.0002	0.0541	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		BH02 2.5-2.6	EM2319006	2.5 - 2.6	-	23.9	-	0.0004	0.0003	0.0016	<0.0002	0.0012	<0.0002	<0.001	0.0003	0.0012	<0.0002	<0.0002	<0.0002	
BH03	18 Oct 2023	BH03 0.6-0.7	EM2319006	0.6 - 0.7	-	8.0	-	<0.0002	<0.0002	0.0051	0.0014	0.467	<0.0002	<0.001	<0.0002	0.0003	<0.0002	0.0004	<0.0002	
		BH03 0.08-0.18	EM2319006	0.08 - 0.18	-	5.2	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0214	0.0006	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		FD03 [intra-laboratory duplicate sample of BH03_0.08-0.18]																		
			EM2319006	0.08 - 0.18	-	4.9	-	<0.0002	<0.0002	0.0002	<0.0002	0.0257	0.0007	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		FS03 [inter-laboratory duplicate sample of BH03_0.08-0.18]	1038561		5.1	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
BH04	18 Oct 2023	BH03 0.9-1.0	EM2319006	0.9 - 1	-	23.2	-	<0.0002	0.0005	0.0166	0.0006	0.0006	<0.0002	<0.001	0.0006	0.0018	0.0002	0.0019	<0.0002	
		BH04 0.2-0.3	EM2319006	0.2 - 0.3	-	3.8	-	<0.0002	0.0002	0.0134	0.0016	0.518	<0.0002	<0.001	<0.0002	0.0011	<0.0002	0.0008	<0.0002	
		BH04 0.08-0.18	EM2319006	0.08 - 0.18	-	3.3	-	<0.0002	<0.0002	0.0002	<0.0002	0.0177	0.0006	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		FD04 [intra-laboratory duplicate sample of BH04_0.08-0.18]																		
			EM2319006	0.08 - 0.18	-	2.7	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0158	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		FS04 [inter-laboratory duplicate sample of BH04_0.08-0.18]																		
			1038561		2.5	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.022	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
		BH04 2.9-3.0	EM2319006	2.9 - 3	-	44.4	-	0.0014	0.0022	0.0104	<0.0002	0.0037	<0.0002	<0.001	0.0005	0.0027	0.0006	<0.0002	<0.0002	
		BH04 PAVER	EM2319006		-	6.0	-	<0.0002	0.0013	0.0200	0.0008	0.0459	0.0029	<0.001	<0.0002	0.0036	0.0010	0.0019	<0.0002	
		BH05 0.08-0.12	EM2319006	0.08 - 0.12	-	7.4	-	<0.0002	<0.0002	0.0026	<0.0002	0.0129	0.0027	<0.001	0.0004	0.0007	<0.0002	0.0004	<0.0002	
BH05	18 Oct 2023	BH05 0.9-1.0	EM2319006	0.9 - 1	-	7.7	-	0.0066	0.0131	0.237	0.0155	0.0156	<0.0002	0.002	0.0122	0.0283	0.0040	0.0226	<0.0002	
		BH06 0.3-0.4	EM2319006	0.3 - 0.4	-	14.8	-	0.0002	0.0003	0.0085	0.0008	0.324	0.0012	<0.001	0.0007	0.0021	0.0002	0.0010	<0.0002	
BH06	18 Oct 2023	BH06 1.0-1.1	EM2319006	1 - 1.1	-	20.8	-	0.0030	0.0052	0.0766	0.0003	0.0008	<0.0002	<0.001	0.0042	0.0150	0.0019	0.0034	<0.0002	
		BH07 0.35-0.45	EM2319006	0.35 - 0.45	-	3.7	-	0.0028	0.0024	0.0223	0.0020	0.480	0.0005	<0.001	0.0042	0.0166	0.0011	0.0030	0.0009	
BH07	18 Oct 2023	BH07 1.8-1.9	EM2319006	1.8 - 1.9	-	28.1	-	0.0078	0.0057	0.0215	<0.0002	0.0007	<0.0002	0.002	0.0043	0.0145	0.0008	0.0003	<0.0002	
		BH07 PAVER	EM2319557		-	3.1	-	0.0052	0.0049	0.0388	0.0025	0.0834	0.0004	<0.001	0.0014	0.0089	0.0010	0.0017	<0.0002	
		FD02 [intra-laboratory duplicate sample of BH07_PAVER]																		
			EM2319006	0 - 0.08	-	3.9	-	0.0008	0.0011	0.0096	0.0007	0.0540	0.0004	<0.001	0.0003	0.0020	0.0003	0.0007	<0.0002	
		FS02 [inter-laboratory duplicate sample of BH07_PAVER]	1038561		3.4	-	<0.005	0.0066	<0.005	0.033	<0.005	0.065	<0.005	<0.005	<0.005	0.014	<0.005	<0.005	<0.005	
MW01	19 Oct 2023	MW01 0.08-0.18	EM2319006	0.08 - 0.18	-	4.5	-	<0.0002	<0.0002	0.0005	<0.0002	0.0242	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		MW01 3.4-3.5	EM2319006	3.4 - 3.5	-	24.4	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
MW02	19 Oct 2023	MW02 0.08-0.18	EM2319006	0.08 - 0.18	-	5.7	-	<0.0002	<0.0002	0.0002	<0.0002	0.0934	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		FD05 [intra-laboratory duplicate sample of MW02_0.08-0.18]																		
			EM2319006	0.08 - 0.18	-	4.8	-	<0.0002	<0.0002	0.0005	<0.0002	0.150	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		FS05 [inter-laboratory duplicate sample of MW02_0.08-0.18]	1038561		5.3	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.18	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
MW03	19 Oct 2023	MW02 1.3-1.4	EM2319006	1.3 - 1.4	-	30.5	-	0.0026	0.0053	0.0308	<0.0002	<0.0002	<0.0002	<0.001	0.0013	0.0083	0.0014	0.0006	<0.0002	
		MW02 2.7-2.8	EM2319006	2.7 - 2.8	-	13.9	-	0.0016	0.0011	0.0050	<0.0002	0.0003	<0.0002	<0.001	0.0008	0.0028	0.0002	0.0003	<0.0002	
		MW03 1.8-1.9	EM2319006	1.8 - 1.9	-	35.2	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		MW03 3.4-3.5	EM2319006	3.4 - 3.5	-	14.4	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
		SS01	EM2319006		-	6.2	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0137	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
SS02	18 Oct 2023	SS02	EM2319006		-	2.0	-	0.0005	<0.0002	0.0012	<0.0002	0.0055	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
SS03	18 Oct 2023	SS03	EM2319006		-	2.1	-	<0.0002	<0.0002	0.0019	0.0002	0.0363	0.0081	<0.001	0.0002	0.0003	0.0003	0.0007	0.0006	
SS04	18 Oct 2023	SS04	EM2319006		-	22.1	-	0.0014	0.0008	0.0141	0.0010	0.148	0.0032	<0.001	0.0030	0.0032	0.0018	0.0021	0.0044	
SS05	18 Oct 2023	SS05	EM2319006		-	2.6	-	0.0007	0.0007	0.0111	0.0017	0.397	0.0221	<0.001	0.0033	0.0045	0.0014	0.0049	0.0036	
SS06	18 Oct 2023	SS06	EM2319006		-	4.5	-	<0.0002	<0.0002	0.0017	<0.0002	0.0165	0.0006	0.002	0.0040	0.0018	0.0008	0.0015	0.0015	



					Misc.	Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids							PFAS - Perfluoroalkyl Carboxylic Acids					
					% Moisture	Moisture (%)	Perfluoropropanesulfonic acid (PFPrS)	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 (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)
					%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SS07	18 Oct 2023	SS07	EM2319006		-	3.3	-	<0.0002	<0.0002	0.0002	<0.0002	0.0072	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SS08	18 Oct 2023	SS08	EM2319006		-	1.4	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0063	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SS10	18 Oct 2023	SS10	EM2319006		-	7.2	-	<0.0002	0.0004	0.0197	0.0016	0.246	0.0182	<0.001	<0.0002	0.0003	0.0003	0.0013	<0.0002
SS11	18 Oct 2023	SS11	EM2319006		-	4.7	-	<0.0002	<0.0002	0.0004	<0.0002	0.0296	0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Comments

#1 This is the higher criterion for (the existing ecological indirect exposure) intensely developed sites with no secondary consumers and minimal potential for indirect ecological exposure. For indicative purposes only.

#2 If the concentration of PFHxS > PFOS this guideline value needs to be adjusted accordingly. Please refer to Section 8.5.2.1 of the PFAS NEMP 2.0 guideline for further information

Environmental Standards

HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure

HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites

HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)

28/06/2023, SA MFS Site Specific Criteria - Metropolitan (Staffed)



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					boxylic Acids					PFAS - Perfluoroalkyl Sulfonamide								PFAS - Fluorotelomer Sulfonic		
					Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
EQL					0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	
PFAS NEMP 2.0 2020 Ecological direct exposure																				
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites																				
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)																				
SA MFS Site Specific Criteria - Metropolitan (Staffed)																				

Location Code	Date	Field ID	Lab Report Number	Depth															
BH01	18 Oct 2023	BH01 0.08-0.12	EM2319006	0.08 - 0.12	<0.0002	<0.0002	0.0008	<0.0002	<0.0005	0.0003	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0010
		BH01 1.4-1.5	EM2319006	1.4 - 1.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH02	18 Oct 2023	BH02 0.3-0.4	EM2319006	0.3 - 0.4	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH02 2.5-2.6	EM2319006	2.5 - 2.6	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH03	18 Oct 2023	BH03 0.6-0.7	EM2319006	0.6 - 0.7	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH03 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0025	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FD03 [intra-laboratory duplicate sample of BH03_0.08-0.18]																	
		EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0026	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FS03 [inter-laboratory duplicate sample of BH03_0.08-0.18]	1038561		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005
BH04	18 Oct 2023	BH03 0.9-1.0	EM2319006	0.9 - 1	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH04 0.2-0.3	EM2319006	0.2 - 0.3	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0012	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH04 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0006	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FD04 [intra-laboratory duplicate sample of BH04_0.08-0.18]																	
		EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FS04 [inter-laboratory duplicate sample of BH04_0.08-0.18]																	
		1038561		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005	
		BH04 2.9-3.0	EM2319006	2.9 - 3	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH04 PAVER	EM2319006		<0.0002	<0.0002	0.0024	0.0003	<0.0005	0.0008	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH05	18 Oct 2023	BH05 0.08-0.12	EM2319006	0.08 - 0.12	0.0010	0.0002	<0.0002	<0.0002	<0.0005	0.0014	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
BH05 0.9-1.0	EM2319006	0.9 - 1		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	
BH06	18 Oct 2023	BH06 0.3-0.4	EM2319006	0.3 - 0.4	0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0008	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH06 1.0-1.1	EM2319006	1 - 1.1	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH07	18 Oct 2023	BH07 0.35-0.45	EM2319006	0.35 - 0.45	0.0038	0.0003	0.0002	<0.0002	<0.0005	0.0007	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0138	0.0188
		BH07 1.8-1.9	EM2319006	1.8 - 1.9	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH07 PAVER	EM2319557		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0009	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0007
		FD02 [intra-laboratory duplicate sample of BH07_PAVER]																	
		EM2319006	0 - 0.08	0.0002	0.0002	0.0005	<0.0002	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0015
		FS02 [inter-laboratory duplicate sample of BH07_PAVER]																	
		1038561		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005	
		MW01 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		MW01 3.4-3.5	EM2319006	3.4 - 3.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		MW02	19 Oct 2023	MW02 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0013	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005
FD05 [intra-laboratory duplicate sample of MW02_0.08-0.18]																			
EM2319006	0.08 - 0.18	<0.0002		<0.0002	<0.0002	<0.0002	<0.0005	0.0017	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	
FS05 [inter-laboratory duplicate sample of MW02_0.08-0.18]																			
1038561		<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005		
	19 Oct 2023	MW02 1.3-1.4	EM2319006	1.3 - 1.4	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		MW02 2.7-2.8	EM2319006	2.7 - 2.8	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		MW03 1.8-1.9	EM2319006	1.8 - 1.9	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0					



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					boxylic Acids					PFAS - Perfluoroalkyl Sulfonamide						PFAS - Fluorotelomer Sulfonic /			
					Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SS07	18 Oct 2023	SS07	EM2319006		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS08	18 Oct 2023	SS08	EM2319006		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS10	18 Oct 2023	SS10	EM2319006		<0.0002	0.0002	0.0006	<0.0002	<0.0005	0.0016	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS11	18 Oct 2023	SS11	EM2319006		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005

Comments
#1 This is the higher criterion for (the existing ecological indirect exposure) intensely developed sites with no secondary
#2 If the concentration of PFHxS > PFOS this guideline value needs to be adjusted accordingly. Please refer to Section 6.1

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)
28/06/2023, SA MFS Site Specific Criteria - Metropolitan (Staffed)



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

	cids	PFAS - Sums					PFAS
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluorononane sulfonate (PFNS)
EQL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	0.0005	0.0002	0.005	0.0002	0.005	0.0002	0.005
PFAS NEMP 2.0 2020 Ecological direct exposure							
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites							
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)		2 ^{#2}					
SA MFS Site Specific Criteria - Metropolitan (Staffed)		14					

Location Code	Date	Field ID	Lab Report Number	Depth							
BH01	18 Oct 2023	BH01 0.08-0.12	EM2319006	0.08 - 0.12	0.0011	0.0086	-	0.0144	-	0.0101	-
		BH01 1.4-1.5	EM2319006	1.4 - 1.5	<0.0005	0.0062	-	0.0198	-	0.0183	-
BH02	18 Oct 2023	BH02 0.3-0.4	EM2319006	0.3 - 0.4	<0.0005	0.0544	-	0.0544	-	0.0544	-
		BH02 2.5-2.6	EM2319006	2.5 - 2.6	<0.0005	0.0028	-	0.0050	-	0.0047	-
BH03	18 Oct 2023	BH03 0.6-0.7	EM2319006	0.6 - 0.7	<0.0005	0.472	-	0.474	-	0.473	-
		BH03 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0214	-	0.0245	-	0.0214	-
		FD03 [intra-laboratory duplicate sample of BH03_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0005	0.0259	-	0.0292	-	0.0259	-
		FS03 [inter-laboratory duplicate sample of BH03_0.08-0.18]	1038561		<0.005	0.027	0.027	<0.05	0.027	0.027	<0.005
		BH03 0.9-1.0	EM2319006	0.9 - 1	<0.0005	0.0172	-	0.0228	-	0.0217	-
BH04	18 Oct 2023	BH04 0.2-0.3	EM2319006	0.2 - 0.3	<0.0005	0.531	-	0.536	-	0.533	-
		BH04 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0179	-	0.0191	-	0.0179	-
		FD04 [intra-laboratory duplicate sample of BH04_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0005	0.0158	-	0.0167	-	0.0158	-
		FS04 [inter-laboratory duplicate sample of BH04_0.08-0.18]	1038561		<0.005	0.022	0.022	<0.05	0.022	0.022	<0.005
		BH04 2.9-3.0	EM2319006	2.9 - 3	<0.0005	0.0141	-	0.0215	-	0.0193	-
BH05	18 Oct 2023	BH04 PAVER	EM2319006		<0.0005	0.0659	-	0.0809	-	0.0724	-
		BH05 0.08-0.12	EM2319006	0.08 - 0.12	<0.0005	0.0155	-	0.0424	-	0.0371	-
BH06	18 Oct 2023	BH05 0.9-1.0	EM2319006	0.9 - 1	<0.0005	0.253	-	0.357	-	0.328	-
		BH06 0.3-0.4	EM2319006	0.3 - 0.4	<0.0005	0.332	-	0.340	-	0.337	-
BH07	18 Oct 2023	BH06 1.0-1.1	EM2319006	1 - 1.1	<0.0005	0.0774	-	0.110	-	0.105	-
		BH07 0.35-0.45	EM2319006	0.35 - 0.45	0.0073	0.502	-	0.581	-	0.563	-
		BH07 1.8-1.9	EM2319006	1.8 - 1.9	<0.0005	0.0222	-	0.0576	-	0.0519	-
		BH07 PAVER	EM2319557		0.0058	0.122	-	0.156	-	0.141	-
		FD02 [intra-laboratory duplicate sample of BH07_PAVER]	EM2319006	0 - 0.08	0.0120	0.0636	-	0.0849	-	0.0692	-
MW01	19 Oct 2023	FS02 [inter-laboratory duplicate sample of BH07_PAVER]	1038561		<0.005	0.098	0.065	0.1186	0.098	0.1186	<0.005
		MW01 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0247	-	0.0247	-	0.0247	-
MW02	19 Oct 2023	MW01 3.4-3.5	EM2319006	3.4 - 3.5	<0.0005	<0.0002	-	<0.0002	-	<0.0002	-
		MW02 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0936	-	0.0953	-	0.0936	-
		FD05 [intra-laboratory duplicate sample of MW02_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0005	0.150	-	0.153	-	0.150	-
		FS05 [inter-laboratory duplicate sample of MW02_0.08-0.18]	1038561		<0.005	0.18	0.18	0.18	0.18	0.18	<0.005
		MW02 1.3-1.4	EM2319006	1.3 - 1.4	<0.0005	0.0308	-	0.0503	-	0.0450	-
MW03	19 Oct 2023	MW02 2.7-2.8	EM2319006	2.7 - 2.8	<0.0005	0.0053	-	0.0121	-	0.0110	-
		MW03 1.8-1.9	EM2319006	1.8 - 1.9	<0.0005	<0.0002	-	<0.0002	-	<0.0002	-
		MW03 3.4-3.5	EM2319006	3.4 - 3.5	<0.0005	<0.0002	-	<0.0002	-	<0.0002	-
SS01	18 Oct 2023	SS01	EM2319006		<0.0005	0.0137	-	0.0141	-	0.0137	-
SS02	18 Oct 2023	SS02	EM2319006		<0.0005	0.0067	-	0.0072	-	0.0072	-
SS03	18 Oct 2023	SS03	EM2319006		<0.0005	0.0382	-	0.0494	-	0.0397	-
SS04	18 Oct 2023	SS04	EM2319006		0.0007	0.162	-	0.189	-	0.175	-
SS05	18 Oct 2023	SS05	EM2319006		0.0024	0.408	-	0.472	-	0.437	-
SS06	18 Oct 2023	SS06	EM2319006		<0.0005	0.0182	-	0.0326	-	0.0297	-



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					cids	PFAS - Sums					PFAS
					10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluorononane sulfonate (PFNS)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SS07	18 Oct 2023	SS07	EM2319006		<0.0005	0.0074	-	0.0074	-	0.0074	-
SS08	18 Oct 2023	SS08	EM2319006		<0.0005	0.0063	-	0.0063	-	0.0063	-
SS10	18 Oct 2023	SS10	EM2319006		<0.0005	0.266	-	0.290	-	0.268	-
SS11	18 Oct 2023	SS11	EM2319006		<0.0005	0.0300	-	0.0302	-	0.0300	-

Comments
#1 This is the higher criterion for (the existing ecological indirect exposure) intensely developed sites with no secondary
#2 If the concentration of PFHxS > PFOS this guideline value needs to be adjusted accordingly. Please refer to Section 6

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)
28/06/2023, SA MFS Site Specific Criteria - Metropolitan (Staffed)



PFAS - Perfluoroalkyl Sulfonic Acids								PFAS - Perfluoroalkyl Carboxylic Acids									
Perfluoropropanesulfonic acid (PFPrS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)				
µg/L	µg/L	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	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.01	0.01							
ADWG 2011 Recreational (v3.7 updated 2022)											5.6						
PFAS NEMP 2.0 2020 Health Drinking Water			0.07		0.07						0.56						
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system					0.13						220						
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system					0.00023						19						
PFAS NEMP 2.0 2020 Recreational Water			2		2						10						

Location Code	Date	Field ID	Lab Report Number	Depth													
MW01	26 Oct 2023	MW01	EM2319459		-	0.40	0.22	1.44	<0.02	0.02	<0.02	<0.1	0.20	0.49	0.07	0.11	<0.02
	26 Oct 2023	QC1 [intra-laboratory duplicate sample of MW01]	EM2319459		-	0.46	0.21	1.38	<0.02	0.01	<0.02	<0.1	0.20	0.48	0.07	0.10	<0.02
	26 Oct 2023	QC1A [inter-laboratory duplicate sample of MW01]	1040229		0.33	0.43	0.26	1.2	0.02	0.01	<0.01	0.09	0.15	0.43	0.06	0.10	<0.01
MW02	26 Oct 2023	MW02	EM2319459		-	1.68	0.94	4.88	0.18	0.18	<0.02	0.3	0.74	2.67	0.24	0.24	<0.02
MW03	26 Oct 2023	MW03	EM2319459		-	0.14	0.03	0.03	<0.02	<0.01	<0.02	<0.1	0.03	0.11	<0.02	<0.01	<0.02

Environmental Standards
National Health and Medical Research Council, January 2022, ADWG 2011 Recreational (v3.7 updated 2022)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water



									PFAS - Perfluoroalkyl Sulfonamide								PFAS - Fluorotelomer Sulfonic Acid		
					Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTTrDA)	Perfluorotetradecanoic acid (PFTTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
EQL					0.01	0.01	0.01	0.01	0.02	0.05	0.05	0.02	0.05	0.05	0.02	0.01	0.05	0.01	
ADWG 2011 Recreational (v3.7 updated 2022)																			
PFAS NEMP 2.0 2020 Health Drinking Water																			
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system																			
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system																			
PFAS NEMP 2.0 2020 Recreational Water																			

Location Code	Date	Field ID	Lab Report Number	Depth														
MW01	26 Oct 2023	MW01	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05
	26 Oct 2023	QC1 [intra-laboratory duplicate sample of MW01]	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05
	26 Oct 2023	QC1A [inter-laboratory duplicate sample of MW01]	1040229		<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.01
MW02	26 Oct 2023	MW02	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.08	<0.05
MW03	26 Oct 2023	MW03	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05

Environmental Standards
National Health and Medical Research Council, January 2022, ADWG 2011 Recreational (v3.7 updated 2022)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water



Appendix X
Table X
Table Name

					acids	PFAS - Sums					PFAS
					10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluoronane sulfonate (PFNS)
EQL					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ADWG 2011 Recreational (v3.7 updated 2022)					0.01	0.01	0.01	0.01	0.01	0.01	0.01
PFAS NEMP 2.0 2020 Health Drinking Water						0.07					
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system											
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system											
PFAS NEMP 2.0 2020 Recreational Water						2					

Location Code	Date	Field ID	Lab Report Number	Depth							
MW01	26 Oct 2023	MW01	EM2319459		<0.05	1.46	-	2.95	-	2.73	-
	26 Oct 2023	QC1 [intra-laboratory duplicate sample of MW01]	EM2319459		<0.05	1.39	-	2.91	-	2.70	-
	26 Oct 2023	QC1A [inter-laboratory duplicate sample of MW01]	1040229		<0.01	1.21	0.11	3.08	1.31	2.47	<0.01
MW02	26 Oct 2023	MW02	EM2319459		<0.05	5.06	-	12.1	-	11.0	-
MW03	26 Oct 2023	MW03	EM2319459		<0.05	0.03	-	0.34	-	0.31	-

Environmental Standards
National Health and Medical Research Council, January 2022, ADWG 2011 Recreational (v3.7 updated 2022)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

	Misc.	Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids							PFAS - Perfluoroalkyl Car					
	% Moisture_ %	Moisture (%)	Perfluoropropanesulfonic acid (PFPrS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)
EQL	1	0.1	mg/kg 0.005	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.001	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.0002	mg/kg 0.0002
PFAS NEMP 2.0 2020 Ecological direct exposure								1						10	
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites								0.14 ^{#1}							
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)						2		2						20	
SA MFS Site Specific Criteria - Metropolitan (Staffed)														50	

Location Code	Date	Field ID	Lab Report Number	Depth															
BH01	18 Oct 2023	BH01 0.08-0.12	EM2319006	0.08 - 0.12	-	4.2	-	<0.0002	<0.0002	0.0007	<0.0002	0.0079	0.0021	<0.001	0.0002	0.0003	<0.0002	<0.0002	<0.0002
		BH01 1.4-1.5	EM2319006	1.4 - 1.5	-	31.4	-	0.0022	0.0015	0.0062	<0.0002	<0.0002	<0.0002	<0.001	0.0018	0.0071	0.0007	0.0003	<0.0002
BH02	18 Oct 2023	BH02 0.3-0.4	EM2319006	0.3 - 0.4	-	5.3	-	<0.0002	<0.0002	0.0003	<0.0002	0.0541	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		BH02 2.5-2.6	EM2319006	2.5 - 2.6	-	23.9	-	0.0004	0.0003	0.0016	<0.0002	0.0012	<0.0002	<0.001	0.0003	0.0012	<0.0002	<0.0002	<0.0002
BH03	18 Oct 2023	BH03 0.6-0.7	EM2319006	0.6 - 0.7	-	8.0	-	<0.0002	<0.0002	0.0051	0.0014	0.467	<0.0002	<0.001	<0.0002	0.0003	<0.0002	0.0004	<0.0002
		BH03 0.08-0.18	EM2319006	0.08 - 0.18	-	5.2	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0214	0.0006	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		FD03 [intra-laboratory duplicate sample of BH03_0.08-0.18]	EM2319006	0.08 - 0.18	-	4.9	-	<0.0002	<0.0002	0.0002	<0.0002	0.0257	0.0007	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		FS03 [inter-laboratory duplicate sample of BH03_0.08-0.18]	1038561		5.1	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.027	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
		BH03 0.9-1.0	EM2319006	0.9 - 1	-	23.2	-	<0.0002	0.0005	0.0166	0.0006	0.0006	<0.0002	<0.001	0.0006	0.0018	0.0002	0.0019	<0.0002
BH04	18 Oct 2023	BH04 0.2-0.3	EM2319006	0.2 - 0.3	-	3.8	-	<0.0002	0.0002	0.0134	0.0016	0.518	<0.0002	<0.001	<0.0002	0.0011	<0.0002	0.0008	<0.0002
		BH04 0.08-0.18	EM2319006	0.08 - 0.18	-	3.3	-	<0.0002	<0.0002	0.0002	<0.0002	0.0177	0.0006	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		FD04 [intra-laboratory duplicate sample of BH04_0.08-0.18]	EM2319006	0.08 - 0.18	-	2.7	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0158	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		FS04 [inter-laboratory duplicate sample of BH04_0.08-0.18]	1038561		2.5	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.022	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
		BH04 2.9-3.0	EM2319006	2.9 - 3	-	44.4	-	0.0014	0.0022	0.0104	<0.0002	0.0037	<0.0002	<0.001	0.0005	0.0027	0.0006	<0.0002	<0.0002
BH05	18 Oct 2023	BH04 PAVER	EM2319006		-	6.0	-	<0.0002	0.0013	0.0200	0.0008	0.0459	0.0029	<0.001	<0.0002	0.0036	0.0010	0.0019	<0.0002
		BH05 0.08-0.12	EM2319006	0.08 - 0.12	-	7.4	-	<0.0002	<0.0002	0.0026	<0.0002	0.0129	0.0027	<0.001	0.0004	0.0007	<0.0002	0.0004	<0.0002
BH06	18 Oct 2023	BH05 0.9-1.0	EM2319006	0.9 - 1	-	7.7	-	0.0066	0.0131	0.237	0.0155	0.0156	<0.0002	0.002	0.0122	0.0283	0.0040	0.0226	<0.0002
		BH06 0.3-0.4	EM2319006	0.3 - 0.4	-	14.8	-	0.0002	0.0003	0.0085	0.0008	0.324	0.0012	<0.001	0.0007	0.0021	0.0002	0.0010	<0.0002
BH07	18 Oct 2023	BH06 1.0-1.1	EM2319006	1 - 1.1	-	20.8	-	0.0030	0.0052	0.0766	0.0003	0.0008	<0.0002	<0.001	0.0042	0.0150	0.0019	0.0034	<0.0002
		BH07 0.35-0.45	EM2319006	0.35 - 0.45	-	3.7	-	0.0028	0.0024	0.0223	0.0020	0.480	0.0005	<0.001	0.0042	0.0166	0.0011	0.0030	0.0009
		BH07 1.8-1.9	EM2319006	1.8 - 1.9	-	28.1	-	0.0078	0.0057	0.0215	<0.0002	0.0007	<0.0002	0.002	0.0043	0.0145	0.0008	0.0003	<0.0002
		BH07 PAVER	EM2319557		-	3.1	-	0.0052	0.0049	0.0388	0.0025	0.0834	0.0004	<0.001	0.0014	0.0089	0.0010	0.0017	<0.0002
		FD02 [intra-laboratory duplicate sample of BH07_PAVER]	EM2319006	0 - 0.08	-	3.9	-	0.0008	0.0011	0.0096	0.0007	0.0540	0.0004	<0.001	0.0003	0.0020	0.0003	0.0007	<0.0002
MW01	19 Oct 2023	FS02 [inter-laboratory duplicate sample of BH07_PAVER]	1038561		3.4	-	<0.005	0.0066	<0.005	0.033	<0.005	0.065	<0.005	<0.005	<0.005	0.014	<0.005	<0.005	<0.005
		MW01 0.08-0.18	EM2319006	0.08 - 0.18	-	4.5	-	<0.0002	<0.0002	0.0005	<0.0002	0.0242	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
MW02	19 Oct 2023	MW01 3.4-3.5	EM2319006	3.4 - 3.5	-	24.4	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		MW02 0.08-0.18	EM2319006	0.08 - 0.18	-	5.7	-	<0.0002	<0.0002	0.0002	<0.0002	0.0934	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		FD05 [intra-laboratory duplicate sample of MW02_0.08-0.18]	EM2319006	0.08 - 0.18	-	4.8	-	<0.0002	<0.0002	0.0005	<0.0002	0.150	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		FS05 [inter-laboratory duplicate sample of MW02_0.08-0.18]	1038561		5.3	-	<0.005	<0.005	<0.005	<0.005	<0.005	0.18	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
		MW02 1.3-1.4	EM2319006	1.3 - 1.4	-	30.5	-	0.0026	0.0053	0.0308	<0.0002	<0.0002	<0.0002	<0.001	0.0013	0.0083	0.0014	0.0006	<0.0002
MW03	19 Oct 2023	MW02 2.7-2.8	EM2319006	2.7 - 2.8	-	13.9	-	0.0016	0.0011	0.0050	<0.0002	0.0003	<0.0002	<0.001	0.0008	0.0028	0.0002	0.0003	<0.0002
		MW03 1.8-1.9	EM2319006	1.8 - 1.9	-	35.2	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SS01	18 Oct 2023	MW03 3.4-3.5	EM2319006	3.4 - 3.5	-	14.4	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		SS01	EM2319006		-	6.2	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0137	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SS02	18 Oct 2023	SS02	EM2319006		-	2.0	-	0.0005	<0.0002	0.0012	<0.0002	0.0055	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SS03	18 Oct 2023	SS03	EM2319006		-	2.1	-	<0.0002	<0.0002	0.0019	0.0002	0.0363	0.0081	<0.001	0.0002	0.0003	0.0003	0.0007	0.0006
SS04	18 Oct 2023	SS04	EM2319006		-	22.1	-	0.0014	0.0008	0.0141	0.0010	0.148	0.0032	<0.001	0.0030	0.0032	0.0018	0.0021	0.0044
SS05	18 Oct 2023	SS05	EM2319006		-	2.6	-	0.0007	0.0007	0.0111	0.0017	0.397	0.0221	<0.001	0.0033	0.0045	0.0014	0.0049	0.0036
SS06	18 Oct 2023	SS06	EM2319006		-	4.5	-	<0.0002	<0.0002	0.0017	<0.0002	0.0165	0.0006	0.002	0.0040	0.0018	0.0008	0.0015	0.0015



					Misc.	Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids							PFAS - Perfluoroalkyl Carboxylic Acids					
					% Moisture	Moisture (%)	Perfluoropropanesulfonic acid (PFPrS)	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 (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)
					%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SS07	18 Oct 2023	SS07	EM2319006		-	3.3	-	<0.0002	<0.0002	0.0002	<0.0002	0.0072	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SS08	18 Oct 2023	SS08	EM2319006		-	1.4	-	<0.0002	<0.0002	<0.0002	<0.0002	0.0063	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
SS10	18 Oct 2023	SS10	EM2319006		-	7.2	-	<0.0002	0.0004	0.0197	0.0016	0.246	0.0182	<0.001	<0.0002	0.0003	0.0003	0.0013	<0.0002
SS11	18 Oct 2023	SS11	EM2319006		-	4.7	-	<0.0002	<0.0002	0.0004	<0.0002	0.0296	0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Comments
#1 This is the higher criterion for (the existing ecological indirect exposure) intensely developed sites with no secondary consumers and minimal potential for indirect ecological exposure. For indicative purposes only.
#2 If the concentration of PFHxS > PFOS this guideline value needs to be adjusted accordingly. Please refer to Section 8.5.2.1 of the PFAS NEMP 2.0 guideline for further information

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)
28/06/2023, SA MFS Site Specific Criteria - Metropolitan (Staffed)



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

	Carboxylic Acids					PFAS - Perfluoroalkyl Sulfonamide							PFAS - Fluorotelomer Sulfonic Acid		
	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)
EQL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PFAS NEMP 2.0 2020 Ecological direct exposure	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites															
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)															
SA MFS Site Specific Criteria - Metropolitan (Staffed)															

Location Code	Date	Field ID	Lab Report Number	Depth															
BH01	18 Oct 2023	BH01 0.08-0.12	EM2319006	0.08 - 0.12	<0.0002	<0.0002	0.0008	<0.0002	<0.0005	0.0003	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0010
		BH01 1.4-1.5	EM2319006	1.4 - 1.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH02	18 Oct 2023	BH02 0.3-0.4	EM2319006	0.3 - 0.4	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH02 2.5-2.6	EM2319006	2.5 - 2.6	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH03	18 Oct 2023	BH03 0.6-0.7	EM2319006	0.6 - 0.7	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH03 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0025	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FD03 [intra-laboratory duplicate sample of BH03_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0026	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FS03 [inter-laboratory duplicate sample of BH03_0.08-0.18]	1038561		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005
		BH03 0.9-1.0	EM2319006	0.9 - 1	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH04	18 Oct 2023	BH04 0.2-0.3	EM2319006	0.2 - 0.3	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0012	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH04 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0006	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FD04 [intra-laboratory duplicate sample of BH04_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FS04 [inter-laboratory duplicate sample of BH04_0.08-0.18]	1038561		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005
		BH04 2.9-3.0	EM2319006	2.9 - 3	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH05	18 Oct 2023	BH04 PAVER	EM2319006		<0.0002	<0.0002	0.0024	0.0003	<0.0005	0.0008	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH05 0.08-0.12	EM2319006	0.08 - 0.12	0.0010	0.0002	<0.0002	<0.0002	<0.0005	0.0014	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0201
BH06	18 Oct 2023	BH05 0.9-1.0	EM2319006	0.9 - 1	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH06 0.3-0.4	EM2319006	0.3 - 0.4	0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0008	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
BH07	18 Oct 2023	BH06 1.0-1.1	EM2319006	1 - 1.1	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH07 0.35-0.45	EM2319006	0.35 - 0.45	0.0038	0.0003	0.0002	<0.0002	<0.0005	0.0007	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0138	0.0188
		BH07 1.8-1.9	EM2319006	1.8 - 1.9	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		BH07 PAVER	EM2319557		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0009	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0007
		FD02 [intra-laboratory duplicate sample of BH07_PAVER]	EM2319006	0 - 0.08	0.0002	0.0002	0.0005	<0.0002	<0.0005	0.0006	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0015
MW01	19 Oct 2023	FS02 [inter-laboratory duplicate sample of BH07_PAVER]	1038561		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005
		MW01 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
MW02	19 Oct 2023	MW01 3.4-3.5	EM2319006	3.4 - 3.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		MW02 0.08-0.18	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0013	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FD05 [intra-laboratory duplicate sample of MW02_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	0.0017	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		FS05 [inter-laboratory duplicate sample of MW02_0.08-0.18]	1038561		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005
		MW02 1.3-1.4	EM2319006	1.3 - 1.4	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
MW03	19 Oct 2023	MW02 2.7-2.8	EM2319006	2.7 - 2.8	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		MW03 1.8-1.9	EM2319006	1.8 - 1.9	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS01	18 Oct 2023	MW03 3.4-3.5	EM2319006	3.4 - 3.5	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
		SS01	EM2319006		0.0004	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS02	18 Oct 2023	SS02	EM2319006		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS03	18 Oct 2023	SS03	EM2319006		0.0004	<0.0002	0.0002	<0.0002	<0.0005	0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS04	18 Oct 2023	SS04	EM2319006		0.0011	0.0015	0.0005	<0.0002	<0.0005	0.0006	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0012
SS05	18 Oct 2023	SS05	EM2319006		0.0013	0.0008	0.0006	<0.0002	<0.0005	0.0017	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0039	0.0106
SS06	18 Oct 2023	SS06	EM2319006		0.0004	0.0002	0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	0.0014



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					boxylic Acids					PFAS - Perfluoroalkyl Sulfonamide						PFAS - Fluorotelomer Sulfonic /			
					Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SS07	18 Oct 2023	SS07	EM2319006		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS08	18 Oct 2023	SS08	EM2319006		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS10	18 Oct 2023	SS10	EM2319006		<0.0002	0.0002	0.0006	<0.0002	<0.0005	0.0016	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005
SS11	18 Oct 2023	SS11	EM2319006		<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005

Comments
#1 This is the higher criterion for (the existing ecological indirect exposure) intensely developed sites with no secondary
#2 If the concentration of PFHxS > PFOS this guideline value needs to be adjusted accordingly. Please refer to Section 6

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)
28/06/2023, SA MFS Site Specific Criteria - Metropolitan (Staffed)



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

	cids	PFAS - Sums					PFAS
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluorononane sulfonate (PFNS)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.0005	0.0002	0.005	0.0002	0.005	0.0002	0.005
PFAS NEMP 2.0 2020 Ecological direct exposure							
PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites							
PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)		2 ^{#2}					
SA MFS Site Specific Criteria - Metropolitan (Staffed)		14					

Location Code	Date	Field ID	Lab Report Number	Depth							
BH01	18 Oct 2023	BH01 0.08-0.12	EM2319006	0.08 - 0.12	0.0011	0.0086	-	0.0144	-	0.0101	-
		BH01 1.4-1.5	EM2319006	1.4 - 1.5	<0.0005	0.0062	-	0.0198	-	0.0183	-
BH02	18 Oct 2023	BH02 0.3-0.4	EM2319006	0.3 - 0.4	<0.0005	0.0544	-	0.0544	-	0.0544	-
		BH02 2.5-2.6	EM2319006	2.5 - 2.6	<0.0005	0.0028	-	0.0050	-	0.0047	-
BH03	18 Oct 2023	BH03 0.6-0.7	EM2319006	0.6 - 0.7	<0.0005	0.472	-	0.474	-	0.473	-
		BH03 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0214	-	0.0245	-	0.0214	-
		FD03 [intra-laboratory duplicate sample of BH03_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0005	0.0259	-	0.0292	-	0.0259	-
		FS03 [inter-laboratory duplicate sample of BH03_0.08-0.18]	1038561		<0.005	0.027	0.027	<0.05	0.027	0.027	<0.005
		BH03 0.9-1.0	EM2319006	0.9 - 1	<0.0005	0.0172	-	0.0228	-	0.0217	-
BH04	18 Oct 2023	BH04 0.2-0.3	EM2319006	0.2 - 0.3	<0.0005	0.531	-	0.536	-	0.533	-
		BH04 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0179	-	0.0191	-	0.0179	-
		FD04 [intra-laboratory duplicate sample of BH04_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0005	0.0158	-	0.0167	-	0.0158	-
		FS04 [inter-laboratory duplicate sample of BH04_0.08-0.18]	1038561		<0.005	0.022	0.022	<0.05	0.022	0.022	<0.005
		BH04 2.9-3.0	EM2319006	2.9 - 3	<0.0005	0.0141	-	0.0215	-	0.0193	-
BH05	18 Oct 2023	BH04 PAVER	EM2319006		<0.0005	0.0659	-	0.0809	-	0.0724	-
		BH05 0.08-0.12	EM2319006	0.08 - 0.12	<0.0005	0.0155	-	0.0424	-	0.0371	-
BH06	18 Oct 2023	BH05 0.9-1.0	EM2319006	0.9 - 1	<0.0005	0.253	-	0.357	-	0.328	-
		BH06 0.3-0.4	EM2319006	0.3 - 0.4	<0.0005	0.332	-	0.340	-	0.337	-
BH07	18 Oct 2023	BH06 1.0-1.1	EM2319006	1 - 1.1	<0.0005	0.0774	-	0.110	-	0.105	-
		BH07 0.35-0.45	EM2319006	0.35 - 0.45	0.0073	0.502	-	0.581	-	0.563	-
		BH07 1.8-1.9	EM2319006	1.8 - 1.9	<0.0005	0.0222	-	0.0576	-	0.0519	-
		BH07 PAVER	EM2319557		0.0058	0.122	-	0.156	-	0.141	-
		FD02 [intra-laboratory duplicate sample of BH07_PAVER]	EM2319006	0 - 0.08	0.0120	0.0636	-	0.0849	-	0.0692	-
MW01	19 Oct 2023	FS02 [inter-laboratory duplicate sample of BH07_PAVER]	1038561		<0.005	0.098	0.065	0.1186	0.098	0.1186	<0.005
		MW01 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0247	-	0.0247	-	0.0247	-
MW02	19 Oct 2023	MW01 3.4-3.5	EM2319006	3.4 - 3.5	<0.0005	<0.0002	-	<0.0002	-	<0.0002	-
		MW02 0.08-0.18	EM2319006	0.08 - 0.18	<0.0005	0.0936	-	0.0953	-	0.0936	-
		FD05 [intra-laboratory duplicate sample of MW02_0.08-0.18]	EM2319006	0.08 - 0.18	<0.0005	0.150	-	0.153	-	0.150	-
		FS05 [inter-laboratory duplicate sample of MW02_0.08-0.18]	1038561		<0.005	0.18	0.18	0.18	0.18	0.18	<0.005
		MW02 1.3-1.4	EM2319006	1.3 - 1.4	<0.0005	0.0308	-	0.0503	-	0.0450	-
MW03	19 Oct 2023	MW02 2.7-2.8	EM2319006	2.7 - 2.8	<0.0005	0.0053	-	0.0121	-	0.0110	-
		MW03 1.8-1.9	EM2319006	1.8 - 1.9	<0.0005	<0.0002	-	<0.0002	-	<0.0002	-
		MW03 3.4-3.5	EM2319006	3.4 - 3.5	<0.0005	<0.0002	-	<0.0002	-	<0.0002	-
SS01	18 Oct 2023	SS01	EM2319006		<0.0005	0.0137	-	0.0141	-	0.0137	-
SS02	18 Oct 2023	SS02	EM2319006		<0.0005	0.0067	-	0.0072	-	0.0072	-
SS03	18 Oct 2023	SS03	EM2319006		<0.0005	0.0382	-	0.0494	-	0.0397	-
SS04	18 Oct 2023	SS04	EM2319006		0.0007	0.162	-	0.189	-	0.175	-
SS05	18 Oct 2023	SS05	EM2319006		0.0024	0.408	-	0.472	-	0.437	-
SS06	18 Oct 2023	SS06	EM2319006		<0.0005	0.0182	-	0.0326	-	0.0297	-



Appendix G
Table 1
Soil Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					cids	PFAS - Sums					PFAS
					10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluorononane sulfonate (PFNS)
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SS07	18 Oct 2023	SS07	EM2319006		<0.0005	0.0074	-	0.0074	-	0.0074	-
SS08	18 Oct 2023	SS08	EM2319006		<0.0005	0.0063	-	0.0063	-	0.0063	-
SS10	18 Oct 2023	SS10	EM2319006		<0.0005	0.266	-	0.290	-	0.268	-
SS11	18 Oct 2023	SS11	EM2319006		<0.0005	0.0300	-	0.0302	-	0.0300	-

Comments
#1 This is the higher criterion for (the existing ecological indirect exposure) intensely developed sites with no secondary
#2 If the concentration of PFHxS > PFOS this guideline value needs to be adjusted accordingly. Please refer to Section 6

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological direct exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure – Developed sites
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Residential w/ min opportunities for soil access (HIL B)
28/06/2023, SA MFS Site Specific Criteria - Metropolitan (Staffed)



Appendix G
Table 2
Groundwater Results

PFAS - Perfluoroalkyl Sulfonic Acids								PFAS - Perfluoroalkyl Carboxylic Acids									
Perfluoropropanesulfonic acid (PFPrS)	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 (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)				
µg/L	µg/L	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	0.01	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.01				
ADWG 2011 Recreational (v3.7 updated 2022)												5.6					
PFAS NEMP 2.0 2020 Health Drinking Water			0.07		0.07						0.56						
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system					0.13						220						
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system					0.00023						19						
PFAS NEMP 2.0 2020 Recreational Water			2		2						10						

Location Code	Date	Field ID	Lab Report Number	Depth													
MW01	26 Oct 2023	MW01	EM2319459		-	0.40	0.22	1.44	<0.02	0.02	<0.02	<0.1	0.20	0.49	0.07	0.11	<0.02
	26 Oct 2023	QC1 [intra-laboratory duplicate sample of MW01]	EM2319459		-	0.46	0.21	1.38	<0.02	0.01	<0.02	<0.1	0.20	0.48	0.07	0.10	<0.02
	26 Oct 2023	QC1A [inter-laboratory duplicate sample of MW01]	1040229		0.33	0.43	0.26	1.2	0.02	0.01	<0.01	0.09	0.15	0.43	0.06	0.10	<0.01
MW02	26 Oct 2023	MW02	EM2319459		-	1.68	0.94	4.88	0.18	0.18	<0.02	0.3	0.74	2.67	0.24	0.24	<0.02
MW03	26 Oct 2023	MW03	EM2319459		-	0.14	0.03	0.03	<0.02	<0.01	<0.02	<0.1	0.03	0.11	<0.02	<0.01	<0.02

Environmental Standards
National Health and Medical Research Council, January 2022, ADWG 2011 Recreational (v3.7 updated 2022)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water



Appendix G
Table 2
Groundwater Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					PFAS - Perfluoroalkyl Sulfonamide								PFAS - Fluorotelomer Sulfonic Acid					
					Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.01	0.01	0.01	0.01	0.02	0.05	0.05	0.02	0.05	0.05	0.02	0.01	0.05	0.01
ADWG 2011 Recreational (v3.7 updated 2022)																		
PFAS NEMP 2.0 2020 Health Drinking Water																		
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system																		
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system																		
PFAS NEMP 2.0 2020 Recreational Water																		

Location Code	Date	Field ID	Lab Report Number	Depth														
MW01	26 Oct 2023	MW01	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05
	26 Oct 2023	QC1 [intra-laboratory duplicate sample of MW01]	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05
	26 Oct 2023	QC1A [inter-laboratory duplicate sample of MW01]	1040229		<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.01
MW02	26 Oct 2023	MW02	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.08	<0.05
MW03	26 Oct 2023	MW03	EM2319459		<0.02	<0.02	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05

Environmental Standards
National Health and Medical Research Council, January 2022, ADWG 2011 Recreational (v3.7 updated 2022)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water



Appendix G
Table 2
Groundwater Results

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

					acids	PFAS - Sums					PFAS
					10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	PFAS (Sum of Total)(WA DER List)	Perfluoronane sulfonate (PFNS)
EQL					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
ADWG 2011 Recreational (v3.7 updated 2022)					0.01	0.01	0.01	0.01	0.01	0.01	0.01
PFAS NEMP 2.0 2020 Health Drinking Water						0.07					
PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system											
PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system											
PFAS NEMP 2.0 2020 Recreational Water						2					

Location Code	Date	Field ID	Lab Report Number	Depth							
MW01	26 Oct 2023	MW01	EM2319459		<0.05	1.46	-	2.95	-	2.73	-
	26 Oct 2023	QC1 [intra-laboratory duplicate sample of MW01]	EM2319459		<0.05	1.39	-	2.91	-	2.70	-
	26 Oct 2023	QC1A [inter-laboratory duplicate sample of MW01]	1040229		<0.01	1.21	0.11	3.08	1.31	2.47	<0.01
MW02	26 Oct 2023	MW02	EM2319459		<0.05	5.06	-	12.1	-	11.0	-
MW03	26 Oct 2023	MW03	EM2319459		<0.05	0.03	-	0.34	-	0.31	-

Environmental Standards
National Health and Medical Research Council, January 2022, ADWG 2011 Recreational (v3.7 updated 2022)
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 95%-slightly-moderately disturbed system
HEPA, January 2020, PFAS NEMP 2.0 2020 Interim marine - 99% - high conservation value system
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

Appendix H

Wall permits

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	449008
Expiry Date:	28/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:
CT 5450/700
Allotment 21 in Deposited Plan 20135
Hundred of Yatala
2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. The activity shall not significantly increase local drawdown.
18. The activity shall not adversely affect the quality, quantity and accessibility of water for supply from existing wells operated by other landholders.
19. The well subject to this permit must not be completed as an industrial water supply well unless prior approval has been obtained from the department.
20. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
21. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
22. The well is not to penetrate beyond a depth of 15 metres unless approved by the Regional Hydrogeologist.
23. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

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6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
7. This permit does not authorise the taking of water from the well for any purpose other than testing.
8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or omissions may result in the variation, suspension or revocation of the permit.



Date: 28/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY
pursuant to section 112 of the Landscape South Australia Act 2019
WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	449009
Expiry Date:	28/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:
CT 5450/700
Allotment 21 in Deposited Plan 20135
Hundred of Yatala
2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. The activity shall not significantly increase local drawdown.
18. The activity shall not adversely affect the quality, quantity and accessibility of water for supply from existing wells operated by other landholders.
19. The well subject to this permit must not be completed as an industrial water supply well unless prior approval has been obtained from the department.
20. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
21. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
22. The well is not to penetrate beyond a depth of 15 metres unless approved by the Regional Hydrogeologist.
23. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

DEPARTMENT FOR ENVIRONMENT AND WATER

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8. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

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Date: 28/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

DEPARTMENT FOR ENVIRONMENT AND WATER

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PERMIT to undertake a WATER AFFECTING ACTIVITY
pursuant to section 112 of the Landscape South Australia Act 2019
WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	449010
Expiry Date:	28/09/2024

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Monitoring

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:
CT 5450/700
Allotment 21 in Deposited Plan 20135
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2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
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Date: 28/09/2023

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

Appendix I

Well Survey Results



To: Terrence Wilson
Company: GHD
Phone: 0413 476 581

From: Lincoln Jeffery
Phone: 0414 840 569
Email: Lincoln@linkupconstructionsurveys.com.au

Date: 7/11/2023

Monitoring well coordinates – MFS Port Adelaide – Cnr Grand Junction Rd & Langham Pl, Port Adelaide

Well or Bore	Easting	Northing	R.L. Top of Casing	Natural Surface
No.	GDA20	GDA20	A.H.D.	A.H.D.
MW01	271954.882	6140411.388	1.130	1.236
MW02	271914.142	6140412.652	1.136	1.219
MW03	271901.655	6140449.733	1.137	1.203

All Survey information was based from the GDA20 Z54 grid system and Australian Height Datum (AHD), Triangulated from Network Survey Marks.

Appendix J

Groundwater Gauging and Purge Records



Bore ID: M1W01

[illegible][illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

<i>Purge Volumes</i>			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7
*Double for gravel pack			

Job Information	Sampling Information	Bore Information
Client: <u>MFS</u>	Purge Method:.....	SWL(mbTOC): <u>2.071</u> m Logic Check:
Project: <u>Port Adelaide CME</u>	Sample Method:.....	Screen: From:.....to..... m Stick Up: m
Proj. No.: <u>1266804</u>	WQ Meter Type:.....	NAPL Check:..... Bore Diam.: mm
Sampler: <u>JA</u>	Flow Cell: Y / N Pump Depth:.....m	Ref.datum: Well Cap Secure?.....
Date: <u>26/10/23</u>	WLevel Meter Type: Dip / Fox / Int.Fce / Gge	Bore Depth: <u>3.985</u> m
Round	Field Filtered? Y / N (filter vessel, disposable filter/syringe)	

[illegible]

Field QA Checks:									
Air bubbles in vials? Y / N	Any violent reactions? Y / N								
Decontamination as per GHD procedure? Y / N									
Was sampling equipment pre-cleaned? Y / N									
COC updated? Y / N									

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

<i>Purge Volumes</i>			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7
*Double for gravel pack			

Bore ID: MLW03



WL Meter Type: Dip / Fox / Int.Fce / Gge

Date: 20/10/2023

Time: 10:25

Sampler: TW

[illegible]



WL Meter Type: Dip / Fox / Int.Fce / Gge

Date: 20/10/2023

Time: 09:30

Sampler: TW

[illegible]



WL Meter Type: Dip / Fox / Int.Fce / Gge

Date: 19/10/2023

Time: 1430

Sampler: TW / NP

[illegible]



Bore ID: M1W01

[illegible][illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

<i>Purge Volumes</i>			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7
*Double for gravel pack			

Job Information	Sampling Information	Bore Information
Client: <u>MFS</u>	Purge Method:.....	SWL(mbTOC): <u>2.071</u> m Logic Check:
Project: <u>Port Adelaide CME</u>	Sample Method:.....	Screen: From:.....to..... m Stick Up: m
Proj. No.: <u>1266804</u>	WQ Meter Type:.....	NAPL Check:..... Bore Diam.: mm
Sampler: <u>JA</u>	Flow Cell: Y / N Pump Depth:.....m	Ref.datum: Well Cap Secure?.....
Date: <u>26/10/23</u>	WLevel Meter Type: Dip / Fox / Int.Fce / Gge	Bore Depth: <u>3.985</u> m
Round	Field Filtered? Y / N (filter vessel, disposable filter/syringe)	

[illegible][illegible]

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes			
Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7
*Double for gravel pack			

Bore ID: MLW03



WL Meter Type: Dip / Fox / Int.Fce / Gge

Date: 20/10/2023

Time: 10:25

Sampler: TW

[illegible]



WL Meter Type: Dip / Fox / Int.Fce / Gge

Date: 20/10/2023

Time: 09:30

Sampler: TW

[illegible]



WL Meter Type: Dip / Fox / Int.Fce / Gge

Date: 19/10/2023

Time: 1430

Sampler: TW / NP

[illegible]

Appendix K

QA/QC Report



Appendix K
Table 5
Field Blank Table

Lab Report Number Date Field ID Matrix Type Sample Type			18 Oct 2023	18 Oct 2023	19 Oct 2023	19 Oct 2023	26 Oct 2023
			FB01	RB01	FB02	RB02	R01
			EM2319006	EM2319006	EM2319006	EM2319006	EM2319459
			Water	Water	Water	Water	Water
			Field_B	Rinsate	Field_B	Rinsate	Rinsate
	Unit	EQL					
PFAS - Perfluoroalkyl Sulfonic Acids							
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS - Perfluoroalkyl Carboxylic Acids							
Perfluorobutanoic acid (PFBA)	µg/L	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
PFAS - Perfluoroalkyl Sulfonamide							
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS - Fluorotelomer Sulfonic Acids							
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
PFAS - Sums							
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFAS (Sum of Total)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFAS (Sum of Total)(WA DER List)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01



Appendix K
Table 4
Groundwater RPD Table

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

Location Code Date Field ID Matrix Type Sample Type Lab Report Number			MW01			MW01		
			26 Oct 2023	26 Oct 2023		26 Oct 2023	26 Oct 2023	
			MW01	QC1		MW01	QC1A	
			Water	Water		Water	Water	
			Normal	Field_D		Normal	Interlab_D	
			EM2319459	EM2319459	RPD	EM2319459	1040229	RPD
	Unit	EQL						
PFAS - Perfluoroalkyl Sulfonic Acids								
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	0.33	-
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.40	0.46	14	0.40	0.43	7
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.22	0.21	5	0.22	0.26	17
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	1.44	1.38	4	1.44	1.2	18
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	0.02	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.02	0.01	67	0.02	0.01	67
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	0.09	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.20	0.20	0	0.20	0.15	29
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.49	0.48	2	0.49	0.43	13
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.07	0.07	0	0.07	0.06	15
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.11	0.10	10	0.11	0.10	10
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotridecanoic acid (PFTTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0
PFAS - Perfluoroalkyl Sulfonamide								
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0



Appendix K
Table 3
Soil RPD Table

Location Code Date Field ID Matrix Type Sample Type Lab Report Number			BH03		RPD	BH03		RPD	BH04		RPD	BH04		RPD
			18 Oct 2023			18 Oct 2023	18 Oct 2023		18 Oct 2023			18 Oct 2023	18 Oct 2023	
			BH03_0.08-0.18	FD03		BH03_0.08-0.18	FS03		BH04_0.08-0.18	FD04		BH04_0.08-0.18	FS04	
			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
			Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
			EM2319006	EM2319006		EM2319006	1038561		EM2319006	EM2319006		EM2319006	1038561	
	Unit	EQL												
Misc.														
% Moisture	%	1	-	-	-	-	5.1	-	-	-	-	-	2.5	-
Inorganics														
Moisture (%)	%	0.1	5.2	4.9	6	5.2	-	-	3.3	2.7	20	3.3	-	-
PFAS - Perfluoroalkyl Sulfonic Acids														
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	0.0002	0	<0.0002	<0.005	0	0.0002	<0.0002	0	0.0002	<0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	0.0214	0.0257	18	0.0214	0.027	23	0.0177	0.0158	11	0.0177	0.022	22
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0002	0.0006	0.0007	15	0.0006	<0.005	0	0.0006	0.0004	40	0.0006	<0.005	0
PFAS - Perfluoroalkyl Carboxylic Acids														
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0	<0.001	<0.005	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS - Perfluoroalkyl Sulfonamide														
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	0.0025	0.0026	4	0.0025	<0.005	0	0.0006	0.0005	18	0.0006	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
PFAS - Fluorotelomer Sulfonic Acids														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS - Sums														
Sum of PFHxS and PFOS	mg/kg	0.0002	0.0214	0.0259	19	0.0214	0.027	23	0.0179	0.0158	12	0.0179	0.022	21
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.005	-	-	-	-	0.027	-	-	-	-	-	0.022	-
PFAS (Sum of Total)	mg/kg	0.0002	0.0245	0.0292	18	0.0245	<0.05	0	0.0191	0.0167	13	0.0191	<0.05	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	0.005	-	-	-	-	0.027	-	-	-	-	-	0.022	-
PFAS (Sum of Total)(WA DER List)	mg/kg	0.0002	0.0214	0.0259	19	0.0214	0.027	23	0.0179	0.0158	12	0.0179	0.022	21
PFAS														
Perfluorononane sulfonate (PFNS)	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-



Appendix K
Table 3
Soil RPD Table

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

Location Code Date Field ID Matrix Type Sample Type Lab Report Number			BH03		RPD	BH03		RPD	BH04		RPD	BH04		RPD
			18 Oct 2023			18 Oct 2023	18 Oct 2023		18 Oct 2023			18 Oct 2023	18 Oct 2023	
			BH03_0.08-0.18	FD03		BH03_0.08-0.18	FS03		BH04_0.08-0.18	FD04		BH04_0.08-0.18	FS04	
			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
			Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
			EM2319006	EM2319006		EM2319006	1038561		EM2319006	EM2319006		EM2319006	1038561	
	Unit	EQL												

*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: 30 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 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 K
Table 3
Soil RPD Table

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

		BH07			BH07			MW02			MW02		
		18 Oct 2023			18 Oct 2023	18 Oct 2023		19 Oct 2023			19 Oct 2023	19 Oct 2023	
		BH07_PAVER	FD02		BH07_PAVER	FS02		MW02_0.08-0.18	FD05		MW02_0.08-0.18	FS05	
		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
		Normal	Field_D		Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D	
		EM2319557	EM2319006		EM2319557	1038561		EM2319006	EM2319006		EM2319006	1038561	
	Unit												
Misc.													
% Moisture	%	-	-	-	-	3.4	-	-	-	-	-	5.3	-
Inorganics													
Moisture (%)	%	3.1	3.9	23	3.1	-	-	5.7	4.8	17	5.7	-	-
PFAS - Perfluoroalkyl Sulfonic Acids													
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0052	0.0008	147	0.0052	0.0066	24	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0049	0.0011	127	0.0049	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0388	0.0096	121	0.0388	0.033	16	0.0002	0.0005	86	0.0002	<0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0025	0.0007	112	0.0025	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0834	0.0540	43	0.0834	0.065	25	0.0934	0.150	47	0.0934	0.18	63
Perfluorodecanesulfonic acid (PFDS)	mg/kg	0.0004	0.0004	0	0.0004	<0.005	0	0.0004	0.0004	0	0.0004	<0.005	0
PFAS - Perfluoroalkyl Carboxylic Acids													
Perfluorobutanoic acid (PFBA)	mg/kg	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0	<0.001	<0.005	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0014	0.0003	129	0.0014	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0089	0.0020	127	0.0089	0.014	45	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0010	0.0003	108	0.0010	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0017	0.0007	83	0.0017	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid (PFNA)	mg/kg	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorodecanoic acid (PFDA)	mg/kg	<0.0002	0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	<0.0002	0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	<0.0002	0.0005	86	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS - Perfluoroalkyl Sulfonamide													
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0009	0.0006	40	0.0009	<0.005	0	0.0013	0.0017	27	0.0013	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	mg/kg	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
PFAS - Fluorotelomer Sulfonic Acids													
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0007	0.0015	73	0.0007	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0058	0.0120	70	0.0058	<0.005	15	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS - Sums													
Sum of PFHxS and PFOS	mg/kg	0.122	0.0636	63	0.122	0.098	22	0.0936	0.150	46	0.0936	0.18	63
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	-	-	-	-	0.065	-	-	-	-	-	0.18	-
PFAS (Sum of Total)	mg/kg	0.156	0.0849	59	0.156	0.1186	27	0.0953	0.153	46	0.0953	0.18	62
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	mg/kg	-	-	-	-	0.098	-	-	-	-	-	0.18	-
PFAS (Sum of Total)(WA DER List)	mg/kg	0.141	0.0692	68	0.141	0.1186	17	0.0936	0.150	46	0.0936	0.18	63
PFAS													
Perfluorononane sulfonate (PFNS)	mg/kg	-	-	-	-	<0.005	-	-	-	-	-	<0.005	-



Appendix K
Table 3
Soil RPD Table

MFS
MFS Port Adelaide
MFS Port Adelaide DSI

		BH07		RPD	BH07		RPD	MW02		RPD	MW02		RPD		
18 Oct 2023		18 Oct 2023			18 Oct 2023			19 Oct 2023			19 Oct 2023			19 Oct 2023	
BH07_PAVER	FD02	BH07_PAVER	FS02		MW02_0.08-0.18	FD05		MW02_0.08-0.18	FS05						
Soil	Soil	Soil	Soil		Soil	Soil		Soil	Soil						
Normal	Field_D	Normal	Interlab_D		Normal	Field_D		Normal	Interlab_D						
EM2319557	EM2319006	EM2319557	1038561		EM2319006	EM2319006		EM2319006	1038561						
Unit															

*RPDs have only been considered where a concer
**Elevated RPDs are highlighted as per QAQC Pro
***Interlab Duplicates are matched on a per comp

Appendix K - Quality Assurance and Quality Control Report

1. GHD QA/QC Assessment

1.1 Laboratories and data set

All samples recovered during the detailed site investigation (DSI) were submitted to ALS and Eurofins, which are National Association of Testing Authorities (NATA) accredited laboratories, accredited to perform the required analysis.

The selected laboratories conducted all the requested analyses in accordance with the guidelines outlined in NEPM 1999 (as amended 2013).

The laboratories used for sample analysis are set out in Table 1.1.

Table 1.1 Analytical laboratories and reports

Laboratory	Primary or Secondary	NATA Certified for Analysis Requested	Report No
ALS	Primary	Yes	EM2319459, EM2319006, EM2319557
Eurofins	Secondary	Yes	1040229, 1038561

The primary results for the DSI are outlined in the Tabulated Analytical Results section of the DSI report. The laboratory certificates of analysis are located in the Laboratory Reports section of the DSI report. The QAQC results for the DSI are outlined in the tables at the end of this QAQC report.

The data quality assessment detailed in the following pages refers to the data provided in these laboratory reports and the results of the QAQC analysis. Please note this QAQC report excludes results and laboratory reports from historical sampling events.

1.2 Data quality indicators

Table 1.2 sets out the QA/QC Data Quality Indicators (DQIs) used in the sampling investigation and outcomes for each of these for each DQI.

Table 1.2 Summary of QA/QC compliance for sampling

Item	Objective	Outcome	References
GHD Internal Procedures			
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results	Achieved	Tabulated Analytical Results Certificates of Analysis Borelogs / Field Records
Calibration of field instruments	Meet calibration specifications	Achieved	Copies of calibration certificates.
Chain of Custody documentation	Supply Chain of Custody Documentation with all samples	Achieved	Copies of Chain of Custody Documentation.
Sample analysis and extraction holding times	Comply with holding times	Achieved	ALS/ Eurofins Laboratory Quality Control Reports.
Analysis of inter- and intra-laboratory duplicate samples	Analysis of duplicate samples in 10% of primary samples	Achieved	AS4482.1-2005 and US EPA NEPM 1999 (as amended 2013) and ALS/Eurofins certificates of analysis.

Item	Objective	Outcome	References
GHD Internal Procedures			
			PFAS NEMP 2.0
Analysis of duplicate and split samples	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 0-30%)	Minor non-conformances as stated in Table 2.1	AS4482.1-2005 and US EPA NEPM 1999 (as amended 2013) and ALS/ Eurofins certificates of analysis. PFAS NEMP 2.0
External Laboratory Procedures			
Analysis of laboratory method blanks	No contamination of blanks	Achieved	ALS/ Eurofins Laboratory Quality Control Reports.
Analysis of laboratory spike recoveries	Recoveries within the laboratory specified recovery limits	Achieved, with some minor non-conformances – see Error! Reference source not found.	ALS/ Eurofins Laboratory Quality Control Reports
Analysis of laboratory internal duplicates	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 0-30%)	Achieved	NEPM 1999 (as amended 2013). ALS/ Eurofins Laboratory Quality Control Reports

QA/QC assessment method

Established QA/QC procedures to assess data quality were maintained throughout the project. The QA/QC program undertaken as part of the assessment by GHD included the following:

- Use of appropriately qualified and trained staff,
- Preservation of samples with ice during transport from the field to the laboratory,
- Transportation of samples with accompanying chain-of-custody documentation,
- Compliance with sample holding times,
- Review of results of blind duplicate samples,
- Review of results of split duplicate samples,
- Review of results of field blank samples,
- Review of internal analysis of laboratory duplicates, spikes and blanks.

The QC program employed during this investigation was in accordance with the general requirements set out in the Australian Standard AS4482.1 (2005) and the NEMP 2.0 (2020) QC samples provide information that discounts or potentially identifies errors due to possible sources of cross contamination, inconsistencies in sampling and analytical techniques used. The QC program completed included the collection and analysis of duplicate samples, rinsate samples and trip blank samples as described below:

- **Split duplicate samples:** These are duplicate samples split in the field, with one sample being sent to a secondary laboratory for analysis. The same parameters are analysed utilising similar analytical techniques.
- **Blind duplicate samples:** These are coded duplicate samples submitted to the primary laboratory for analysis as individual samples without any indication to the laboratory that they have been duplicated.
- **Rinsate samples:** A sample of deionised water collected from equipment used during sampling to indicate whether cross contamination occurred from equipment.
- **Trip Blanks:** A laboratory supplied uncontaminated (blank) deionised water sample which is placed within the ice chest with the samples. This sample is analysed at the laboratory to indicate if contamination occurred during transportation of samples.

A quantitative measure of the duplicate sample results was made using calculated relative percentage difference (RPD) values for each chemical. The RPD values were calculated using the following equation.

$$RPD(\%) = \frac{(C_o - C_s)}{\left(\frac{C_o + C_s}{2}\right)} \times 100$$

Where C_o = reported concentration of the chemical of interest from the original parent sample

C_s = reported concentration of the chemical of interest from the duplicate sample

2. GHD QA/QC

2.1 Duplicate samples

Elevated RPD values for duplicate and split samples are summarised in Table 2.1 and presented in full in at the end of this Appendix.

Table 2.1 *Blind duplicate and split duplicate RPD exceedance summary - soil*

Primary Sample	QC Sample (Duplicate or Split)	Analyte	Primary result (mg/kg unless specified)	Duplicate Result (mg/kg unless specified)	Split result (mg/kg unless specified)	Highest RPD (%)
Soil						
BH04_0.08-0.18	FD04 (D) FS04 (S)	PFDS	0.0006	0.0004	<0.005	40
BH07_PAVER	FD02 (D) FS03 (S)	PFBS	0.0052	0.0008	0.0066	147
		PFPeS	0.0049	0.0011	<0.005	127
		PFHxS	0.0388	0.0096	0.033	121
		PFHpS	0.0025	0.0007	<0.005	112
		PFOS	0.0834	0.0540	0.065	43
		PFPeA	0.0014	0.0003	<0.005	129
		PFHxA	0.0089	0.0020	0.014	127
		PFHpA	0.0010	0.0003	<0.005	108
		PFOA	0.0017	0.0007	<0.005	83
		PFDODA	<0.0002	0.0005	<0.005	86
		FOSA	0.0009	0.0006	<0.005	40
		8:2 FTS	0.0007	0.0015	<0.005	73
		10:2 FTS	0.0058	0.0120	<0.005	70
		Sum of PFHxS and PFOS	0.122	0.0636	0.098	63
		PFAS (Sum of Total)	0.156	0.0849	0.1186	59
		PFAS (Sum of Total) (WA DER List)	0.141	0.0692	0.1186	68
MW02_0.08-0.18	FD05 (D) FS05 (S)	PFHxS	0.0002	0.0005	<0.005	86
		PFOS	0.0934	0.150	0.18	63
		Sum of PFHxS and PFOS	0.0936	0.150	0.18	63
		PFAS (Sum of Total)	0.0953	0.153	0.18	62

		PFAS (Sum of Total)(WA DER List)	0.0936	0.150	0.18	63
Groundwater						
MW01	QC1 (D) QC1A (S)	PFOS	0.02 µg/L	0.01 µg/L	0.01 µg/L	67 µg/L

2.1.1 Soil blind duplicate and split duplicate

The majority of RPDs were calculated within acceptable limits, with exception to some of the PFAS analytes in the 3 duplicate samples. The elevated RPDs can be attributed to the following:

- Low analyte concentrations close to or below the LOR.
- Heterogeneity of soils, particularly soils sampled within fill material.

Given the heterogeneity of soils, the majority of results being within the same order of magnitude, and the relatively minor concentrations reported for the majority of elevated RPDs, GHD considers the data set to be of an acceptable quality for which to base the assessment.

2.1.2 Groundwater blind duplicate and split duplicate samples

The majority of RPDs were calculated within acceptable limits, with the exception to PFOS analyte in both the duplicate and split sample. The elevated calculated RPD was likely to be associated with low analyte concentrations close to or below the LOR.

2.1.3 Blind duplicate and split duplicate sample frequency

A summary of the blind and split duplicate sample frequency is presented in Table 2.2.

Table 2.2 Blind duplicate and split duplicate frequency summary

Primary Samples Count	Blind Duplicate Samples Count	Percentage of Primary Samples	Split Samples Count	Percentage of Primary Samples
Soil (Boreholes)				
20	5	25%	5	25%
Surface Soil				
10	0	-	0	-
Groundwater				
3	1	33.3%	1	33.3%

The QC rates for the samples satisfies the data quality objectives for this investigation as they are in general accordance with Australian Standard AS4482.1-2005 and the NEMP 2.0 (2020).

2.2 Rinsate blank

Three rinsate blank samples were collected during the DSI and analysed for PFAS. All concentrations of PFAS analytes were reported below the laboratory LOR for analyses carried out, meeting the Data Quality Objectives of the project. The tabulated results for rinsate samples are presented at the end of this Appendix.

3. Laboratory QA/QC

3.1 Internal duplicates

All RPDs for laboratory internal duplicates from the ALS reports were within the laboratory nominated acceptable ranges.

3.2 Matrix spikes

The majority of RPDs were calculated within acceptable limits, with the exception to some PFAS analyte in the duplicate samples. Outliers on the matrix spike was likely to due to the recovery is less than lower data quality objective or the matrix recovery was not determined as the background level is greater than or equal to 4x spike level.

3.3 Laboratory control spikes

All laboratory control spikes for laboratory internal duplicates from the ALS reports were within the laboratory nominated acceptable ranges.

3.4 Method blanks

All reported method blank concentrations were less than their respective laboratory LOR and indicating that potential laboratory cross contamination was unlikely to have occurred.

3.5 Compliance with holding times

All analytes were extracted and analysed within both ALS' and Eurofins' technical holding times.

3.6 Laboratory QA/QC summary

Given that the laboratory QA/QC result are all within the nominated acceptable ranges and limits, GHD considered the data to be of satisfactory precision on which to base the assessment.

3.7 Conclusion

Based on the QA/QC program undertaken during the sampling programs, the data obtained during the assessment is to be of an acceptable standard on which to base interpretations and draw conclusions regarding the environmental status of the site.

Oil / Water Interface Meter

Instrument **Geotech Interface Meter (30M)**
Serial No. **4021**



Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
	above 7.9v	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check Connectors	Cleaned	✓	
	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: _____ **Jeremy Callado**

Calibration date: **11-Oct-23**

Next calibration due: **08-Apr-24**



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