

Report

21 July 2023

To	Krystle Mitchell	Contact No.	08 8204 3714
Copy to	Ruby Jones	Email	Krystle.Mitchell@eso.sa.gov.au
From	Ben Petticrew	Project No.	12608483
Project Name	MFS Noarlunga PFAS investigation		
Subject	MFS Noarlunga Command Centre PFAS Assessment in Surface Soils		

Dear Krystle,

1. Background

GHD Pty Ltd (GHD) have been engaged by the South Australian Metropolitan Fire Service (MFS) to conduct a baseline soil assessment for the presence of Per- and polyfluoroalkyl substances (PFAS) contamination at the MFS Noarlunga Command Centre, located at 1 Goldsmith Drive, Noarlunga Centre SA 5168 (the site). For context, a summary background of the site is provided below.

- The Noarlunga Command Fire Station is a replacement of the local Christie Downs Fire Station, which had reached the end of its asset life.
- The site was acquired by MFS in 2017 and officially opened on the 4 February 2023. The site was vacant prior to MFS' development.
- PFAS contamination has been associated with the historical use of aqueous film-forming foams (AFFF) at fire stations; however, the MFS commenced phasing out the use of AFFF containing perfluorooctane sulfonate (PFOS) in 2007 and perfluorooctanoic acid (PFOA) in 2014 and replaced all AFFF in 2016 with "fluorine-free" products. AFFF has never been used by the MFS at the site.
- A desktop review of historical aerial imagery indicates that the site was constructed on a vacant plot of land (c.a. 2004 - 2021).
- A preliminary geotechnical and contamination assessment (TMK 2018) was undertaken at the site, prior to its development by the MFS. The investigation included drilling eight (8) soil bores across the site and identified no exceedances of the adopted commercial/industrial land-use guidelines. While the assessment did not include PFAS analysis, the findings support the lack of any significant historical activities occurring at the site that may have resulting in contamination.
- The site is currently bordered by various emergency services, health-care facilities, aged-care establishments and a hardware store.
- The site location and layout are shown in Figure 1 of Attachment 1 to this document.

1.1 Purpose of this report

Given the absence of PFAS containing AFFF in any MFS appliances or activities and the site's recent acquisition and development by MFS, any identified PFAS contamination is considered likely to be representative of "baseline" conditions. This report summarises the findings of a baseline soil assessment for PFAS from two surface soil samples collected at the site.

1.2 Scope of work

The scope of work for this investigation comprises:

- Collection of two surface soil samples from between surface (0.0) and 0.1 meters below ground level, and two duplicate QA/QC samples at accessible, unpaved locations at the site.
- Submission of samples to a NATA accredited laboratory for analysis.
- Comparison of analytical results to relevant assessment criteria.
- Assessment of the likely source of any identified PFAS contamination and potential risks to human health and the environment.
- Recommendations for supplementary investigations to inform mitigation measures (if required).

1.3 Guidelines

The assessment works and reporting were undertaken in accordance with the South Australian *Environment Protection Act 1993*, the *Environment Protection Regulations 2009*, relevant SA Environment Protection Policies (EPPs) and the following guidelines / standards:

- NSW EPA (2022) *Sampling design* – Part 1 and Part 2.
- HEPA (2020) *PFAS National Environmental Management Plan*, version 2.0 (PFAS NEMP).
- NEPC (1999) *National Environment (Assessment of Site Contamination) Protection Measure 1999*, as amended 2013 (ASC NEPM).
- SA EPA (2019) *Guidelines for the Assessment and Remediation of Site Contamination* (the GAR).

1.4 Limitations

This report has been prepared by GHD for the South Australian Metropolitan Fire Service and may only be used and relied on by the South Australian Metropolitan Fire Service for the purpose agreed between GHD and the South Australian Metropolitan Fire Service as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than the 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 assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

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.

2. Methodology

Two surface soil samples (0.0 - 0.1 m bgl) were collected as part of this investigation (refer to Figure 2 in Attachment 1).

A summary of the sampling methodology is provided in Table 1.

Table 1 Summary of sampling methodology

Activity	Description of methodology
General	Preparation and implementation of site-and-task-specific Job Safety and Environmental Assessments (JSEAs) prior to field mobilisation.
Soil sampling	– Soil samples were collected directly from ground surface by hand with a pair of clean nitrile gloves. – Soil samples were placed in laboratory-supplied jars and placed immediately into a cooler and transported to the analytical laboratories under chain of custody (COC) documentation.
NATA accredited laboratories	Samples were tested by the following NATA accredited laboratories: – Primary laboratory: ALS Environmental – Secondary laboratory: Eurofins

2.1 Laboratory analysis

Samples subjected to PFAS testing for the full suite of analytes. Laboratory reports, which lists what comprises the PFAS full suite test, are provided in Attachment 4 The laboratory analytical schedule is summarised in Table 2.

Table 2 Analytical schedule

Number of samples	Analytical schedule
2 primary soil samples	PFAS (full suite)
QA/QC	
1 intra-laboratory duplicate sample	PFAS (full suite)
1 inter-laboratory duplicate sample	PFAS (full suite)

3. Assessment Criteria

PFAS are the key contaminants of concern being addressed by this environmental investigation. As such, the assessment criteria for this investigation were adopted from the following document:

- HEPA 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (PFAS NEMP).

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.

Given the site's use as a fire station, Human Health Investigation Levels for Industrial / Commercial (HIL D) land-use are considered appropriate under the definitions provided in the PFAS NEMP. GHD understands that the MFS, in consultation with the United Fire Fighters Union of South Australia, have agreed to also adopt a more stringent health investigation level (residential with limited soil access [HIL B]) as a "trigger" for further engagement. This has been included at the direction of the MFS and is for comparison purposes only.

The ecological guidelines have been applied to provide a preliminary assessment of potential ecological risks for organisms through direct and indirect exposure; however, as the PFAS NEMP states, the indirect exposure value may be over-protective for a number of considerations, including where the area of exposed soil is too small to have any material impact on the food chain transfer to higher order organisms, or in areas where the contaminated area does not support high value foraging habitat, or secondary consumers are effectively absent from the site.

In accordance with the PFAS NEMP, the following assessment criteria have been adopted based on potential source-pathway-receptor linkages for the site:

Table 3 Adopted PFAS Assessment Criteria

Exposure Scenario	PFOA ¹ (mg/kg)	PFHxS ² (mg/kg)	PFOS ³ (mg/kg)	Sum of PFHxS and PFOS (mg/kg)
PFAS NEMP 2.0 2020 Ecological Direct Exposure	10	-	1	-
PFAS NEMP 2.0 2020 Ecological Indirect Exposure	-	-	0.14	-
PFAS NEMP 2.0 2020 Residential – minimal soil access (HIL B)	20	2	2	2
PFAS NEMP 2.0 2020 Industrial / Commercial (HIL D)	50	20	20	20

Notes:

¹ PFOA – perfluorooctanoic acid

² PFHxS – perfluorohexane sulfonate

³ PFOS – perfluorooctane sulfonate

4. Data validation

A detailed Quality Assurance and Control (QA/QC) assessment was completed for all analytical sample data, to determine whether the results are of suitable quality on which to base the site assessment. This included the collection and review of inter- (split) and intra- (blind) laboratory duplicates. A good indicator of the representativeness and/or precision of duplicate samples is the relative percentage difference (RPD) between primary and blind duplicate / split duplicate samples. None of the RPD results exceeded the adopted 30% acceptance criterion.

Consequently, the data is 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 RPD results is provided in Attachment 2.

5. Results and Discussion

5.1 Field observations

No odours or staining (indicative of the potential presence of other contaminants) were noted in the surface samples obtained.

5.2 Analytical results

A summary of the analytical results is presented in Attachment 3. The laboratory certificates of analysis, including laboratory QA/QC results, are provided in Attachment 4.

With the exception of the following PFAS analytes, the laboratory analysis of soil samples yielded PFAS results below the laboratory's limits of reporting (LOR).

Table 4 PFAS analytes detected

Sample ID	Perfluorohexanoic acid (PFHxA) (mg/kg)
Noarlunga_SS1	< LOR
Noarlunga_SS2	0.0002

5.3 Discussion

No exceedances of the adopted guidelines for potential human health or ecological risks were identified in soil samples collected from the site.

Based on the results, the specific PFAS analytes detected are likely related to diffuse sources and not the site's recent development as an MFS station. Other, anthropogenic sources of the identified PFAS compounds include the following:

- Perfluorohexanoic acid (PFHxA) was an integral constituent of water-resistant coatings utilised in the production of various commercial products, including food packaging.

6. Conclusions

The analytical results identified the presence of PFAS in surface soils at the site. Given there is no evidence of potentially contaminating activities having occurred at the site, the relatively marginal PFAS concentrations detected within the soil samples is considered most likely attributable to a diffuse source.

The identified PFAS concentrations are significantly below the adopted assessment criteria and do not warrant further investigation.

7. References

- Barola, C., Moretti, S., Giusepponi, D., Paoletti, F., Saluti, G., Cruciani, G., Brambilla, G. & Galarini, R. (2020) A liquid chromatography-high resolution mass spectrometry method for the determination of thirty-three per- and polyfluoroalkyl substances in animal liver, *Journal of Chromatography A*, Vol 1628, 27 September 2020
- Gov SA (1993) Environment Protection Act, Government of South Australia, Version 11.2.2023
- Gov SA (2009) Environment Protection Regulations 2009, Government of South Australia, Version 1.7.2022
- HEPA 2020, PFAS National Environmental Management Plan (PFAS NEMP), Version 2.0, Heads of Environment Protection Authorities Australia and New Zealand, January 2020,
- NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (ASC NEPM), National Environment Protection Council, revised 2013
- NSW EPA (2022) *Sampling design* – Part 1 and Part 2, Contaminated Land Guidelines, Environment Protection Authority, New South Wales, August 2022
- PFAS Treatment (2023) What is PFHxA: The Hidden Dangers and Solutions for your Drinking Water, available: [https:// pfastreatment.us](https://pfastreatment.us), accessed 12 July 2023
- SA EPA (2019) Guidelines for the Assessment and Remediation of Site Contamination (GAR), Environment Protection Authority, South Australia, revised November 2019
- TMK (2018) Preliminary Geotechnical & Waste Soil Classification (SA EPA - Criteria) within 39 Alexander Kelly Drive, Noarlunga Centre, South Australia, accessed 20 July 2023
- Victoria EPA (2022) Summary of PFAS concentrations detected in the Environment in Victoria, Publication 2049, Environment Protection Authority, Victoria, October 2022
- Xie, Z., Wang, Z., Mi, W., Moller, A., Wolschke, H. & Ebinghaus, R. (2015) Neutral Poly- perfluoroalkyl Substances in Air and Snow from the Arctic. *Scientific Reports*, 5, 8912
- Zhang, W., Wellington, T.E. & Liang, Y. (2023) Effect of two sorbents on the distribution and transformation of N-ethyl perfluorooctane sulfonamido acetic acid (N-EtFOSAA) in soil-soybean systems, *Environmental Pollution*, Vol 318, 1 February 2023

Attachments

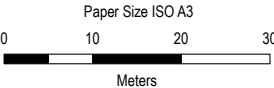
Attachment 1

Figures

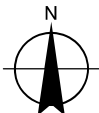


Data Disclaimer

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



South Australian Metropolitan Fire Service
MFS Noarlunga PFAS Investigation

Project No. 12608483
Revision No. A
Date 16/05/2023

Site Location Plan

FIGURE 1

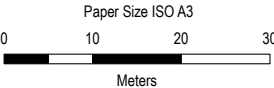
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Data source: GHD: Site Boundary and Sampling Locations (2023); DPTI: Cadastre, Roads, Railways (2015); MetroMap: Imagery (Imagery Date: 17/10/2023; Date Extracted: 16/05/2023) Created by: ejuan

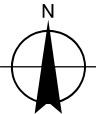


Data Disclaimer

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54



South Australian Metropolitan Fire Service
MFS Noarlunga PFAS Investigation

Project No. 12608483
Revision No. A
Date 16/05/2023

Sample Locations Plan

FIGURE 2

\\ghdnet\ghd\AU\Adelaide\Projects\33\12608483\GIS\Maps\Deliverables\12608483_NoarlungaSiteLocation.aprx
Print date: 16 May 2023 - 16:04

Data source: GHD: Site Boundary and Sampling Locations (2023); DPTI: Cadastre, Roads, Railways (2015); MetroMap: Imagery (Imagery Date: 17/10/2023; Date Extracted: 16/05/2023) Created by: ejuan

Attachment 2

QA/QC Assessment



PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids													
Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)	Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTTrDA)	Perfluorotetradecanoic acid (PFTeDA)			
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005
Location Code	Date	Field ID	Matrix	Sample Type	Lab Report														
Noarlunga_SS1	27/04/2023	Noarlunga_SS1	Surface Soil	Normal	EM2307463	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
	27/04/2023	FD01	Surface Soil	Field_D	EM2307463	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
					RPD (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noarlunga_SS1	27/04/2023	Noarlunga_SS1	Surface Soil	Normal	EM2307463	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
	27/04/2023	FS01	Surface Soil	Interlab_D	985620	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
					RPD (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Relative percentage differences (RPDs) have only been considered where the concentration of both samples is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No limit (1 - 10 x EQL); 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



Attachment 2
Table 1
RPD Calculation Results

SA Metropolitan Fire Service
12608483
MFS Noarlunga PFAS investigation

						PFAS - Perfluoroalkyl Sulfonamide							PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums		
						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)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
						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	0.0005	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002
Location Code	Date	Field ID	Matrix	Sample Type	Lab Report														
Noarlunga_SS1	27/04/2023	Noarlunga_SS1	Surface Soil	Normal	EM2307463	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
	27/04/2023	FD01	Surface Soil	Field_D	EM2307463	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
	RPD (%)					-	-	-	-	-	-	-	-	-	-	-	-	-	-
Noarlunga_SS1	27/04/2023	Noarlunga_SS1	Surface Soil	Normal	EM2307463	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
	27/04/2023	FS01	Surface Soil	Interlab_D	985620	<0.005	<0.005	<0.005	<0.01	<0.005	<0.005	<0.01	<0.005	<0.01	<0.005	<0.005	<0.005	<0.05	<0.01
	RPD (%)					-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Relative percentage differences (RPDs) have only been considered where the concentration of both samples is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No limit (1 - 10 x EQL); 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

Attachment 3

Tabulated Analytical Results



					Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										
					Moisture (%)	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)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)
						%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.1	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005
PFAS NEMP 2.0 2020 Ecological direct exposure										1						10						
PFAS NEMP 2.0 2020 Ecological indirect exposure										0.01												
PFAS NEMP 2.0 2020 Residential - minimal soil access (HIL B)								2		2						20						
PFAS NEMP 2.0 2020 Industrial / Commercial (HIL D)								20		20						50						

Location Code	Date	Field ID	Lab Report	Matrix																		
Noarlunga_SS1	27 Apr 2023	Noarlunga_SS1	EM2307463	Surface soil	13.7	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
Noarlunga_SS2	27 Apr 2023	Noarlunga_SS2	EM2307463	Surface soil	15.0	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005



					PFAS - Perfluoroalkyl Sulfonamide							PFAS - Fluorotelomer Sulfonic Acids				PFAS - Sums		
					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)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Sum of PFHxS and PFOS	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
					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	0.0005	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002
PFAS NEMP 2.0 2020 Ecological direct exposure																		
PFAS NEMP 2.0 2020 Ecological indirect exposure																		
PFAS NEMP 2.0 2020 Residential - minimal soil access (HIL B)																2		
PFAS NEMP 2.0 2020 Industrial / Commercial (HIL D)																20		
Location Code	Date	Field ID	Lab Report	Matrix														
Noarlunga_SS1	27 Apr 2023	Noarlunga_SS1	EM2307463	Surface soil	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Noarlunga_SS2	27 Apr 2023	Noarlunga_SS2	EM2307463	Surface soil	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	0.0002	0.0002

Attachment 4

**Laboratory Reports and Chain of Custody
Documentation**

CHAIN OF CUSTODY

ALS Laboratory:
please tick →

QADELAIDE U3/1 Burma Road Pooraka SA 5095
Ph 08 866 7715 225 Sand Street Stirling QLD 4053
Ph 07 3243 7222 E samples@nsglobal.com
QGLADSTONE 46 Callamondah Drive Clinton QLD 4680
Ph 07 7471 5600 E gladstone@nsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740
 Ph. 07 4944 6177 E. mackay@alsglobal.com
 MELBOURNE 2-4 Vestal Road Springvale VIC 3171
 Ph. 03 8549 9600 E. samples.melbourne@alsglobal.com
 MUDGEE 27 Sydney Road Mudgee NSW 2850
 Ph. 02 6372 6735 E. mudgee.mel@alsglobal.com

☐ NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304
☐ PERTH 9088 9333 E. samp@perthnowaiting.com.au
 Ph. 024423 2063 E. nowait@alsglobal.com
☐ PERTH 10 Hed Way Malaga WA 6009
 Ph. 08 9209 7655 E. samples.perth@alsglobal.com

☐ SYDNEY 277-289 Woodpark Road Smithfield NSW 2164
 Ph 02 5784 9555 E samples.sydney@alsglobal.com
☐ TOWNSVILLE 14-15 Desma Court Bonnie Qld 4818
 Ph 07 4756 0800 E townsville.environmental@alsglobal.com
☐ WOLLONGONG 99 Kenny Street Wollongong NSW 2500
 Ph 02 4225 3125 E portkembla@alsglobal.com

CLIENT: GHD Pty Ltd

OFFICE: 211 Victoria Square, Level 4, Adelaide SA 5000

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):

ALS QUOTE:

ORDER NO.:	12608483
------------	----------

PROJECT: 12608483

PROJECT MANAGER: Vera Biermann

CONTACT PH: 0435981783

SAMPLER: Ally Kirkman

SAMPLER MOBILE: 0412625108

COC emailed to ALS? YES

EDD FORMAT (or default):

Email Reports to: GHDLabReports@ghd.com

Email Invoice to: vera.biermann@ghd.com

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME:

22-4-21C 1330

RELINQUISHED BY:

DATE/TIME:

274-2301500

RECEIVED BY:

DATE/TIME:

284 11.25

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

[illegible]

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 = Vial Acid 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.



CERTIFICATE OF ANALYSIS

Work Order	: EM2307463	Page	: 1 of 5
Amendment	: 1		
Client	: GHD PTY LTD	Laboratory	: Environmental Division Melbourne
Contact	: VERA BIERMANN	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	: 12611012	Date Samples Received	: 28-Apr-2023 10:55
Order number	: ----	Date Analysis Commenced	: 29-Apr-2023
C-O-C number	: ----	Issue Date	: 22-May-2023 13:01
Sampler	: Ally Kirkman		
Site	:		
Quote number	: EN/005		
No. of samples received	: 3		
No. of samples analysed	: 3		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

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

Signatories

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

Signatories	Position	Accreditation Category
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Sanjay Parekh	LCMS Coordinator	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.

- Amendment (22/05/2023): This report has been amended following a change to the EP231X: EtFOSAA result reported for sample EM2307463-001 due to a prep contamination while weighing sample error. All details are recorded in client query 23MECC263 and a full investigation will be detailed in corrective action request 23MEC097.
- 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	Noarlunga_SS1	Noarlunga_SS2	FD01	----	----
Sampling date / time					27-Apr-2023 00:00	27-Apr-2023 00:00	27-Apr-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EM2307463-001	EM2307463-002	EM2307463-003	-----	-----
					Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		13.7	15.0	14.5	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	----	----
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		<0.0002	<0.0002	<0.0002	----	----
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	Noarlunga_SS1	Noarlunga_SS2	FD01	----	----
Sampling date / time					27-Apr-2023 00:00	27-Apr-2023 00:00	27-Apr-2023 00:00	----	----
Compound	CAS Number	LOR	Unit		EM2307463-001	EM2307463-002	EM2307463-003	-----	-----
					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		<0.0002	0.0002	<0.0002	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	0.0002	<0.0002	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		100	98.6	123	----	----
13C8-PFOA	----	0.0002	%		91.1	90.1	85.7	----	----



Surrogate Control Limits

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



QUALITY CONTROL REPORT

Work Order : EM2307463

Page : 1 of 7

Amendment : 1

Client : GHD PTY LTD

Contact : VERA BIERMANN

Address : Level 4, 211 VICTORIA SQUARE
ADELAIDE SA, AUSTRALIA 5000

Telephone : ----

Project : 12611012

Order number : ----

C-O-C number : ----

Sampler : Ally Kirkman

Site :

Quote number : EN/005

No. of samples received : 3

No. of samples analysed : 3

Laboratory : Environmental Division Melbourne

Contact : Peter Ravlic

Address : 4 Westall Rd Springvale VIC Australia 3171

Telephone : +6138549 9645

Date Samples Received : 28-Apr-2023

Date Analysis Commenced : 29-Apr-2023

Issue Date : 22-May-2023



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	Position	Accreditation Category
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Sanjay Parekh	LCMS Coordinator	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: 5018822)									
EM2307223-005	Anonymous	EA055: Moisture Content	----	0.1	%	22.1	22.2	0.5	0% - 20%
EM2307460-006	Anonymous	EA055: Moisture Content	----	0.1	%	22.6	23.4	3.5	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5019562)									
EM2307374-003	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
EM2307463-002	Noarlunga_SS2	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5019562)									
EM2307374-003	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5019562) - continued									
EM2307374-003	Anonymous	EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EM2307463-002	Noarlunga_SS2	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5019562)									
EM2307374-003	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
EM2307463-002	Noarlunga_SS2	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 (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5019562)									
EM2307374-003	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
EM2307463-002	Noarlunga_SS2	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: 5019562)									
EM2307374-003	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
EM2307463-002	Noarlunga_SS2	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

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 (%)		
	Concentration	LCS	Low	High	
Result					
<0.0002	0.00111 mg/kg	83.4	72.0	128	
<0.0002	0.00118 mg/kg	85.8	73.0	123	
<0.0002	0.00114 mg/kg	85.5	67.0	130	
<0.0002	0.00119 mg/kg	95.4	70.0	132	
<0.0002	0.00116 mg/kg	89.2	68.0	136	
<0.0002	0.00121 mg/kg	92.2	59.0	134	
<0.001	0.00625 mg/kg	112	71.0	135	
<0.0002	0.00125 mg/kg	85.2	69.0	132	
<0.0002	0.00125 mg/kg	84.7	70.0	132	
<0.0002	0.00125 mg/kg	81.2	71.0	131	
<0.0002	0.00125 mg/kg	86.0	69.0	133	
<0.0002	0.00125 mg/kg	91.4	72.0	129	
<0.0002	0.00125 mg/kg	78.0	69.0	133	
<0.0002	0.00125 mg/kg	92.3	64.0	136	
<0.0002	0.00125 mg/kg	87.1	69.0	135	
<0.0002	0.00125 mg/kg	73.8	66.0	139	
<0.0005	0.00312 mg/kg	106	69.0	133	
<0.0002	0.00125 mg/kg	86.1	67.0	137	
<0.0005	0.00312 mg/kg	87.9	70.0	130	
<0.0005	0.00312 mg/kg	85.8	70.0	130	
<0.0005	0.00312 mg/kg	84.0	70.0	130	
<0.0005	0.00312 mg/kg	85.0	70.0	130	
<0.0002	0.00125 mg/kg	85.0	63.0	144	
<0.0002	0.00125 mg/kg	79.5	61.0	139	

Matrix Spike (MS) Report

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: 5019562)							
EM2307374-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	80.2	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00118 mg/kg	80.5	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	80.7	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00119 mg/kg	84.7	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	83.8	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00121 mg/kg	90.7	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5019562)							
EM2307374-005	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	111	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	81.4	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	85.0	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	83.8	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	91.8	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	88.0	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	77.6	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	79.2	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	88.8	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	75.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	112	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5019562)							



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: 5019562) - continued							
EM2307374-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	83.4	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	97.1	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	82.9	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	87.1	70.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	86.4	70.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	94.2	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	76.4	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5019562)							
EM2307374-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	87.2	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	81.9	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	71.7	70.0	130



QA/QC Compliance Assessment to assist with Quality Review

Work Order : EM2307463

Page : 1 of 4

Amendment : 1

Client : GHD PTY LTD
Contact : VERA BIERMANN
Project : 12611012
Site :
Sampler : Ally Kirkman
Order number : ----

Laboratory : Environmental Division Melbourne
Telephone : +6138549 9645
Date Samples Received : 28-Apr-2023
Issue Date : 22-May-2023
No. of samples received : 3
No. of samples analysed : 3

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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



Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

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

Method	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) Noarlunga_SS1, FD01	Noarlunga_SS2, 	28-Apr-2023	----	----	----	29-Apr-2023	12-May-2023	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X) Noarlunga_SS1, FD01	Noarlunga_SS2, 	28-Apr-2023	01-May-2023	25-Oct-2023	✓	01-May-2023	10-Jun-2023	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X) Noarlunga_SS1, FD01	Noarlunga_SS2, 	28-Apr-2023	01-May-2023	25-Oct-2023	✓	01-May-2023	10-Jun-2023	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X) Noarlunga_SS1, FD01	Noarlunga_SS2, 	28-Apr-2023	01-May-2023	25-Oct-2023	✓	01-May-2023	10-Jun-2023	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) Noarlunga_SS1, FD01	Noarlunga_SS2, 	28-Apr-2023	01-May-2023	25-Oct-2023	✓	01-May-2023	10-Jun-2023	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) Noarlunga_SS1, FD01	Noarlunga_SS2, 	28-Apr-2023	01-May-2023	25-Oct-2023	✓	01-May-2023	10-Jun-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	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	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.

		Sub-Matrix			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Sample Name			Noarlunga_SS1	Noarlunga_SS1	Noarlunga_SS1	Noarlunga_SS1	FD01	FD01	FD01	FD01
		Sample Description										
		Depth Type			Re-split and re-analysis		Re-extraction1		Re-extraction2		Re-split and re-analysis	
		Depth in metres										
		Analyte			27/04/2023 0:00				27/04/2023 0:00			
Method	Accredited		Units	Rep. LOR	EM2307463-001	EM2307463-001	EM2307463-001	EM2307463-001	EM2307463-003	EM2307463-003	EM2307463-003	EM2307463-003
EP231X	Y	Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	< 0.001	< 0.001	< 0.001	<0.001	< 0.001	< 0.001	< 0.001
EP231X	Y	Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	0.0005	0.0006	< 0.0002	< 0.0002	<0.0002	< 0.0002	< 0.0002	< 0.0002
EP231X	Y	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005	<0.0005	< 0.0005	< 0.0005	< 0.0005
EP231X	Y	Sum of PFAS	mg/kg	0.0002	0.0005	0.0006	0	0	<0.0002	0	0	0
EP231X	Y	Sum of PFHxS and PFOS	mg/kg	0.0002	<0.0002	0	0	0	<0.0002	0	0	0
EP231X	Y	13C4-PFOS	%	0.1	102	93.15	100.15	101.85	123	92.8	102.05	96.2
EP231X	Y	13C8-PFOA	%	0.1	90.4	89.45	91.1	91.65	85.7	87.2	92.55	93.45



ALS Laboratory:
please tick →

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)

Custody Seal Intact?	Yes	No	N/A
----------------------	-----	----	-----

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

7 Random Sample Temperature on Receipt: 16-8 °C

7 Other comment:

ORDER NO.: 12608483

CONTACT PH: 0435981783

SAMPLER MOBILE: 0412625108

EDD FORMAT (or default):

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME:

RELINQUISHED BY:

DATE/TIME:

RECEIVED BY:

DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

[illegible]

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.

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35 O'Rourke Road Penrose, Auckland 1061 Tel: +64 9 526 45 51 IANZ# 1327	43 Detroit Drive Rolleston, Christchurch 7675 Tel: 0800 856 450 IANZ# 1290

Sample Receipt Advice

Company name:	GHD Pty Ltd SA
Contact name:	Vera Biermann
Project name:	Not provided
Project ID:	12608483
Turnaround time:	5 Day
Date/Time received	May 2, 2023 9:00 AM
Eurofins reference	985620

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 Vera Biermann - vera.biermann@ghd.com.

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

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: Vera Biermann

Report 985620-S

Project name

Project ID 12608483

Received Date May 02, 2023

Client Sample ID			FS01
Sample Matrix			Soil
Eurofins Sample No.			M23-My0004051
Date Sampled			Apr 27, 2023
Test/Reference	LOR	Unit	
Sample Properties			
% Moisture	1	%	15
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	84
13C5-PFPeA (surr.)	1	%	87
13C5-PFHxA (surr.)	1	%	105
13C4-PFHpA (surr.)	1	%	99
13C8-PFOA (surr.)	1	%	99
13C5-PFNA (surr.)	1	%	104
13C6-PFDA (surr.)	1	%	95
13C2-PFUnDA (surr.)	1	%	79
13C2-PFDoDA (surr.)	1	%	84
13C2-PFTeDA (surr.)	1	%	81
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE) ^{N11}	5	ug/kg	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE) ^{N11}	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10

Client Sample ID			FS01
Sample Matrix			Soil
Eurofins Sample No.			M23-My0004051
Date Sampled			Apr 27, 2023
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonamido substances			
13C8-FOSA (surr.)	1	%	91
D3-N-MeFOSA (surr.)	1	%	111
D5-N-EtFOSA (surr.)	1	%	124
D7-N-MeFOSE (surr.)	1	%	75
D9-N-EtFOSE (surr.)	1	%	64
D5-N-EtFOSAA (surr.)	1	%	64
D3-N-MeFOSAA (surr.)	1	%	53
Perfluoroalkyl sulfonic acids (PFASs)			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	110
18O2-PFHxS (surr.)	1	%	101
13C8-PFOS (surr.)	1	%	95
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA) ^{N11}	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5
13C2-4:2 FTSA (surr.)	1	%	123
13C2-6:2 FTSA (surr.)	1	%	109
13C2-8:2 FTSA (surr.)	1	%	96
13C2-10:2 FTSA (surr.)	1	%	87
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction 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	May 02, 2023	14 Days
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	May 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	May 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	May 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	May 02, 2023	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	May 02, 2023	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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

Project Name:
Project ID: 12608483

Order No.: 12608483
Report #: 985620
Phone: 08 8111 6600
Fax: 08 8111 6699

Received: May 2, 2023 9:00 AM
Due: May 9, 2023
Priority: 5 Day
Contact Name: Vera Biermann

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	FS01	Apr 27, 2023		Soil	M23-My0004051	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

- Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
- All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
- All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
- Actual LORs are matrix dependant. 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 are performed on homogenised, unfiltered samples, unless noted otherwise.
- Samples were analysed on an 'as received' basis.
- Information identified on this report with **blue** colour, indicates data provided by customer that may have an impact on the results.
- This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

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

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

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
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 a moisture has been determined on a solid sample the result is expressed on a dry 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 is representative of 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

PFAS field samples that contain surrogate recoveries in excess of 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 a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
- Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
- 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)	%	87			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	78			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	89			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	88			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	89			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	94			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	92			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	98			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	86			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	%	95			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	84			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	86			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	94			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	87			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)			%	89			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)			%	84			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	90			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	89			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFASs)									
Perfluorobutanesulfonic acid (PFBS)			%	76			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	98			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	75			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	69			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	82			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	90			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	87			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	91			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	82			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)			%	88			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	87			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	87			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)									
				Result 1					
Perfluorobutanoic acid (PFBA)	M23-Ap0062211	NCP	%	92			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Ap0062211	NCP	%	82			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Ap0062211	NCP	%	89			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Ap0062211	NCP	%	88			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M23-Ap0062211	NCP	%	87			50-150	Pass	
Perfluorononanoic acid (PFNA)	M23-Ap0062211	NCP	%	97			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M23-Ap0062211	NCP	%	97			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Ap0062211	NCP	%	102			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Ap0062211	NCP	%	92			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M23-Ap0062211	NCP	%	109			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Ap0062211	NCP	%	90			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances									
				Result 1					
Perfluorooctane sulfonamide (FOSA)	M23-Ap0062211	NCP	%	88			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Ap0062211	NCP	%	94			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Ap0062211	NCP	%	88			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Ap0062211	NCP	%	91			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Ap0062211	NCP	%	93			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-Ap0062211	NCP	%	95			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Ap0062211	NCP	%	89			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFASs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M23-Ap0062211	NCP	%	71			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M23-Ap0062211	NCP	%	96			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M23-Ap0062211	NCP	%	74			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M23-Ap0062211	NCP	%	70			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M23-Ap0062211	NCP	%	86			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M23-Ap0062211	NCP	%	85			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M23-Ap0062211	NCP	%	84			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M23-Ap0062211	NCP	%	93			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-Ap0062211	NCP	%	79			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Ap0062211	NCP	%	90			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Ap0062211	NCP	%	86			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Ap0062211	NCP	%	87			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-My0004013	NCP	%	7.8	8.3	6.2	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTeDA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M23-Ap0062209	NCP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M23-Ap0062209	NCP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M23-Ap0062209	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-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M23-Ap0062209	NCP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M23-Ap0062209	NCP	ug/kg	< 5	< 5	<1	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Amy Meunier	Analytical Services Manager
Joseph Edouard	Senior Analyst-PFAS
Mary Makarios	Senior Analyst-Sample Properties



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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