Airservices Australia

Cairns Airport

Preliminary Sampling

February 2019

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Appendices

List of abbreviations

General terms	
AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARFF	Aviation Rescue and Fire Fighting
bgl	Below ground level
CSM	Conceptual Site Model
DBYD	Dial Before You Dig
DO	Dissolved Oxygen
DQI	Data Quality Indicator
EC	Electrical Conductivity
EISL	Ecological Interim Screening Level
HISL	Human Health Interim Screening Level
HBSC	Health-based Screening Criteria
HSE	Health, Safety and Environment
ISL	Interim Screening Level
JSEA	Job Safety and Environmental Assessment
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
PFASs	Per- and poly- fluorinated alkyl substances
PFOS	Perfluorooctane sulfonate
PFOA	Perfluorooctanoic acid
PSD	Particle Size Distribution
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling Analysis and Quality Plan
SWL	Standing Water Level
TDS	Total Dissolved Solids
ToC	Top of Casing
TOC	Total Organic Carbon
WHS	Work Health and Safety

Units	
g	grams
ha	Hectare
L	Litre
km	Kilometre
m	Metre
m^2	square metres
g/L	grams per litre
mg/L	milligrams per litre
mbgl	metres below ground level
mg/kg	milligrams per kilogram
mbToC	metres below top of casing
mV	milli-Volt
µg/L	micrograms per litre
µS/cm	micro-Siemens per centimetre

1. Introduction

GHD Pty Ltd (GHD) was engaged by Airservices Australia (Airservices) to complete a preliminary site investigation (PSI) for Cairns Airport (GHD, 2016a) (herein referred to as 'the site').

A Sample Analysis and Quality Plan (SAQP) was subsequently prepared by GHD (GHD, 2016b) for a targeted Preliminary Sampling program which focused on the assessment of potential contamination from the historical use of Aqueous Film Forming Foams (AFFF).

This Preliminary Sampling report documents the methodology and findings of the Preliminary Sampling and provides supporting information to the PSI. The Site locality and investigation area are shown in Figure 1 of Appendix A.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.4. The report should also be read with reference to the PSI which contains further interpretation of the data, including a conceptual site model (CSM).

1.1 Objective of the preliminary sampling

The objective of the Preliminary Sampling was to validate and further investigate the desktop findings of the PSI through a preliminary and targeted soil, sediment, groundwater and surface water sampling program.

1.2 Scope of works

Based on the outcomes of the PSI, a Sampling Analysis and Quality Plan (SAQP) was developed for the investigation (GHD, 2016b).

The SAQP was prepared so that the field investigations and analyses were undertaken in a way that enabled the collection and reporting of reliable data on which to base any further soil, sediment, groundwater and surface water monitoring programs for specific areas of the site.

The GHD SAQP described drilling methods, sampling equipment, well development strategy, sample collection protocols, sample processing, field and laboratory sample analysis, equipment decontamination and quality-assurance and quality-control (QA / QC) procedures.

The scope of the Preliminary Sampling was as follows:

- Development of a Site Work Program including a Health Safety & Environment (HSE) Plan, and review of underground services plans and site plans
- Liaison and coordination of fieldwork with subcontractors, Airservices and Cairns Airport Pty Ltd
- Clearance of all sample locations by a Services Locator
- Drilling of soil bores GW01 to GW07 to a maximum depth of 4.5 metres below ground level (mbgl) and conversion of the bores to groundwater monitoring wells
- Collection of soil samples from soil boreholes at depths of 0.2, 0.5 and 1.0 mbgl and then every metre thereafter, with additional samples collected at any changes in the lithology, to a maximum depth of 4.5 mbgl
- Collection of four surface water samples (SW01 to SW04) and sediment samples (SS01 to SS04) around the airport

- Gauging of seven newly installed monitoring wells and one existing well (EW03) using an oil/water interface probe to measure the depth to groundwater
- Groundwater sampling of all eight monitoring wells using low flow sampling techniques
- Laboratory analysis of soil, sediment, surface water and groundwater samples by ALS Environmental (primary laboratory) and Eurofins MGT (secondary laboratory)
- Collection of QA / QC samples for soil, surface water and groundwater including Duplicate and Split samples
- Placement of all soil cuttings in drums for storage and off-site disposal to a licensed facility
- Surveying of new and existing wells
- Preparation of this Preliminary Sampling Report

1.3 Methodology references

This Preliminary Sampling report was undertaken with reference to the following:

- *Airports Act*, 1996
- *Airports (Environment Protection) Regulations* 1997
- Australian Standard AS 4482.1,2005. *Guide to the investigation and sampling of sites with potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds*
- Australian/New Zealand Standard (AS/NZ) 5667.1,1998. *Water Quality – Sampling. Standards Australia*
- *Environmental Protection Act* 1994 (EP Act)
- GHD, 2015. *Airservices Australia, Managing PFC Contamination at Airports, Interim Contamination Management Strategy and Decision Framework* (GHD Reference 31\32279\239419)
- GHD, 2016b. Airservices Australia, Cairns Airport Sampling Analysis and Quality Plan (GHD reference 31/34071/252990)
- GHD, 2017: PFAS Investigations – Derivation of soil and water criteria
- National Environment Protection Council (NEPC), *National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended by the National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 No. 1* (the ASC NEPM).
- Government of Western Australia, Department of Environmental Regulation (DER), 2016: Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS).

1.4 Limitations

This report has been prepared by GHD for Airservices Australia and may only be used and relied on by Airservices Australia for the purpose agreed between GHD and Airservices Australia as set out in Section 1 of this report. Reliance of other parties on this report is subject to agreement in writing by GHD.

GHD otherwise disclaims responsibility to any person other than Airservices Australia 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.

GHD has prepared this report, partly on the basis of information provided by Airservices Australia, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

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

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

GHD has considered and/or tested for only those chemicals specifically referred to in this Report and makes no statement or representation as to the existence (or otherwise) of any other chemicals.

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

These Limitations should be read in conjunction with the entire Report and no excerpts are taken to be representative of the findings of this Report.

2. Field investigations

2.1 Fieldwork methodology

2.1.1 Fieldwork program

The fieldwork program completed by GHD for the site is summarised in Table 1. It included the following:

- Drilling and installation of seven groundwater monitoring wells to maximum 4.5 mbgl
- Collection of four surface soil samples at targeted locations
- Collection of four surface water samples from open drains on site
- Collection of three sediment samples
- Gauging and sampling of the eight groundwater monitoring wells (including one existing well)

The sampling locations are shown in Figure 2 of Appendix A.

Table 1 Summary of fieldwork program

Date	Activity
4 May 2017	Underground services location
5 May 2017	Drilling, sampling and conversion into groundwater monitoring wells for GW02 to GW06
6 May 2017	Drilling, sampling and conversion into groundwater monitoring wells for GW01 Development of newly installed groundwater monitoring wells
22 – 23 May 2017	Gauging and sampling of all groundwater monitoring wells (Refer to Section 2.3). Collect surface water samples and sediment samples.

2.1.2 Soil investigation

The soil sampling methodology is summarised in Table 2.

Table 2 Soil sampling methodology

Activity	Details
Underground services locating	A Telstra-accredited independent contractor cleared underground services using radio-detection and ground penetrating radar with reference to utility plans provided by Dial Before You Dig (DBYD), prior to any sub-surface works being undertaken
Sampling plan design	The objectives and rationale of the sampling locations were detailed in the SAQP (GHDb, 2016).
Soil borehole drilling	The seven soil borehole sampling locations (GW01 to GW07) were drilled with solid-stem auger to a depth of 3.5 to 4.5 mbgl for the purpose of installing the seven groundwater monitoring wells. Push tubing was attempted for soil sampling but was unsuccessful due to the rock and gravelly fill layer on site. Decontamination of the solid flight auger was undertaken between each sampling location in accordance with the decontamination methodology outlined in the SAQP.
Soil bore sampling	Soil samples were collected from each of the soil boreholes, generally at 0.2 mbgl, 0.5 mbgl and 1 mbgl, and then at approximately 1 m intervals to a

Activity	Details
	maximum depth of 4.5 m or where changes in lithology or potential contamination were observed, unless soil samples were too saturated to be recovered from the drilling. Soil samples were placed into laboratory-supplied glass and plastic jars. A total of 48 soil samples were collected. In addition, six QA/QC samples were collected (QA-01 to QA-06). The records of the soils encountered, and the samples collected (including depths and related observations) are presented in the borehole records (Appendix B) and Laboratory reports (Appendix H). Samples were identified with a unique label, incorporating the sample location and depth (i.e. GW01-0.2 was collected from borehole GW01 at a depth of 0.2 mbgl). Care was taken during the sampling to obtain representative samples from each target level.
Sediment soil samples	Three sediment samples (SS01, SS02 and SS04) were collected from the same location as the surface water samples. Sediment sample SS03 was not collected as the surface water location was located along a concrete drain (no sediment). Description of samples collected are provided in Appendix E. The sediment samples were collected by a trowel and placed into laboratory-supplied jars/containers. Sampling implements were decontaminated between sampling locations in accordance with the decontamination methodology outlined in the SAQP.
Soil logging	Soils encountered during drilling were described and logged by an environmental scientist. Borehole logs are presented in Appendix B.
QA/QC	Six quality control samples (QA-01 to QA-06) were collected including three intra-laboratory (“blind”) samples and three inter-laboratory (“split”) sample. Refer to Appendix G for more details.
Sample preservation and transport	Samples were chilled upon collection, stored on ice in an insulated cooler box while on site and in transit to the laboratory. Samples were transferred to the laboratory under Chain of Custody (COC) documentation. COC documentation is presented in Appendix H.
Soil cuttings	All soil cuttings from drilling activities were contained in 20 L sealed plastic drums and placed at the current fire station for disposal off site to a licensed facility. Disposal dockets are provided in Appendix J.

2.2 Groundwater monitoring and sampling methodology

2.2.1 Groundwater well installation

Soil bores were converted to groundwater monitoring wells as detailed in Table 3. Locations are shown in Figure 2 in Appendix A. Well construction details are provided in the bore logs contained in Appendix B.

Table 3 Groundwater well installation

Activity	Details
Well construction	The monitoring wells were installed in accordance with the *Minimum Construction Requirements for Water Bores in Australia, Edition 3* (2012) and were constructed using 50 mm ID uPVC, Class 18, acid washed threaded standpipe with machine slotted (0.4 mm) screened section. Graded and washed filter sand was installed in and slightly above (0.2 m) the screened interval, then a bentonite seal (0.5 m thick) and grout to the surface. Screened and installation depths varied according to strata, identified conductive horizons, areas of potential contamination and the need to minimise the risk of cross contamination between soil horizons/ units. All monitoring wells were completed at the surface with a flush mounted gatic cover concreted below the ground surface. Details of the monitoring wells construction were provided in the borehole logs in Appendix B.
Well development	The newly installed wells were developed following construction by bailing with disposable bailers. At least 80 L of groundwater was purged out at each monitoring well. GHD considers that the development procedure undertaken was adequate to prepare the wells for collection of representative groundwater samples.
Well Survey	The top of the well casings were surveyed to Australian Height Datum (AHD). In the instance where the top of casing was not evenly cut, the highest point of the top of casing was surveyed. The survey data (with reference level at top of casing) is presented in Appendix C.
Development water disposal	Purged water from the well development was disposed at the current firefighting training ground pad, where the water is captured at the in-ground tank for routine offsite disposal.

2.3 Groundwater monitoring and sampling methodology

A total of eight monitoring wells (GW01 to GW07, EW03) were gauged, purged and sampled.

Details of the groundwater monitoring and sampling methodologies are summarised in Table 4.

Table 4 Groundwater monitoring and sampling methodology

Activity	Details
Well gauging	Prior to the sampling of wells, groundwater standing water levels (SWL) were gauged using an interface probe measuring from the top of the bore casing (TOC). Standing water levels were recorded on field record sheets. The gauged groundwater levels for each well at the site are summarised in Appendix D. The calibration certificate of the interface probe is provided in Appendix I.
Groundwater sampling	All monitoring wells were purged and sampled through low-flow sampling methods using a Geopump® peristaltic pump. Groundwater field parameters were monitored during the purging process using a multi-probe water quality meter, reporting temperature, dissolved oxygen (DO), pH, oxidation-reduction potential (ORP) and electrical conductivity (EC). The calibration certificate of the water quality meter is provided in Appendix I. Groundwater samples were collected directly from the tubing into laboratory-supplied containers (pre-preserved where appropriate) and filled up to minimise headspace. A total of 10 groundwater samples were collected [including two quality assurance (QA)/quality control (QC) samples (QA01, QA02)]. All samples were stored on ice in an esky until delivered to the laboratory. Groundwater gauging and sampling records are provided in Appendix D.

Activity	Details
Decontamination	Decontamination of the interface probe was undertaken through a three stage approach. The first stage involved cleaning the equipment using a mixture of pH neutral phosphate free detergent (Decon® Neutracon) in water, followed by a deionised water wash and a final rinse stage Single-use tubing was used for sample collection to minimise potential for cross contamination.
QA/QC	Two quality control samples were collected including one intra-laboratory ("blind") samples and one inter-laboratory ("split") samples. Refer to Appendix G.
Purge water disposal	Purged water from the well development was disposed at the current firefighting training ground pad, where the water is captured at the in-ground tank for routine offsite disposal.

2.4 Surface water sampling methodology

The surface water sampling methodology is summarised in Table 5.

Table 5 Surface water sampling methodology

Activity	Details
Sampling plan design	The objectives and rationale of the sampling locations were detailed in the SAQP (GHD, 2016b).
Surface water sampling	Surface water samples were collected from four locations (refer to Figure 2 in Appendix A for the sample locations). A total of four surface water samples were submitted to the laboratory for analysis. Samples were collected directly from the surface water bodies using laboratory-supplied bottles.
Surface water logging	Field observations and physicochemical parameters (pH, EC, DO and ORP) of the surface water were recorded by an environmental scientist and results presented in Appendix E.
Sample preservation and transport	Samples were chilled upon collection by storing on ice in an insulated cooler box while on site and in transit to the laboratory. Samples were transferred to the laboratory under Chain of Custody (COC) documentation. COC documentation is presented in Appendix H.

2.5 Work health and safety

GHD prepared a project-specific Job Safety and Environmental Analysis (JSEA) for the site works in accordance with Work Health and Safety (WHS) legislation and associated Codes of Practice. The JSEA consisted of a summary of relevant site activities and specific job-related tasks; a hazard register that identifies all foreseeable hazards; risk ranking and risk management measures for each identified hazard; and procedures for monitoring and / or implementing remedial actions to manage all project-based risks. Prior to undertaking the fieldworks, the GHD field representatives and all subcontractors held a pre-start meeting on site. Daily GHD WHS forms were completed before commencement of work each day.

2.6 Laboratory analysis program

2.6.1 Analytical laboratories

GHD consigned all primary soil, sediment, surface water and groundwater samples and intra-laboratory field duplicate (blind) samples to ALS for analysis. The analysis of inter-laboratory duplicate (split) samples, for QC purposes, was completed by Eurofins MGT.

Both the primary and secondary laboratories are National Association of Testing Authorities (NATA) registered for the analytical program undertaken.

Certified laboratory documentation including chain of custody records, sample receipt notifications, certificates of analysis and laboratory QA / QC reports are provided in Appendix H.

2.6.2 Sample analysis

The number of soil, groundwater and surface water samples collected at the site and the scheduled analyses are documented in Table 6. The list of PFASs analysed in the extended suite and their respective abbreviations is provided in Table 7.

Table 6 Laboratory analytical schedule

Sample type	No. primary samples		No. QC samples	Analytical suite
	Collected	Analysed		
Soil				
Soil borehole	48	16	5	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite Total organic carbon (TOC) Metals/Metalloids [1] Silica Cation exchange capacity (CEC) Particle size distribution (PSD) pH Electrical Conductivity (EC) Potassium
		9	0	Australian Standard Leaching Procedure (ASLP) – PFAS suite (at neutral pH)
Sediment	3	3	0	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite Metals/Metalloids[1] Cation exchange capacity (CEC) pH Total organic carbon (TOC) Potassium
Water				
Groundwater	8	8	2	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite pH Total Dissolved Solids (TDS) Major cations and anions[2]
Surface water	4	4	0	PFOS, PFOA, 6:2 FtS, 8:2 FtS + extended PFASs suite pH Total Dissolved Solids (TDS)

[1] Metal analysis included aluminium, arsenic, cadmium, chromium (III+VI), copper, iron, manganese and zinc.

[2] Major anions of water samples were not analysed during this PSI as the laboratory mistake. No samples left for re-analysis.

Table 7 PFASs analysed within the PFAS suite

Perfluoroalkyl Sulfonic Acids	Abbreviation
Perfluorobutane sulfonic acid	PFBS
Perfluoropentane sulfonic acid	PFPeS
Perfluorohexane sulfonic acid	PFHxS
Perfluoroheptane sulfonic acid	PFHpS
Perfluorooctane sulfonic acid	PFOS
Perfluorodecane sulfonic acid	PFDS
Perfluoroalkyl Carboxylic Acids	
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
Perfluoroalkyl Sulfonamides	
Perfluorooctane sulfonamide	FOSA
N-Methyl perfluorooctane sulfonamide	MeFOSA
N-Ethyl perfluorooctane sulfonamide	EtFOSA
N-Methyl perfluorooctane sulfonamidoethanol	MeFOSE
N-Ethyl perfluorooctane sulfonamidoethanol	EtFOSE
N-Methyl perfluorooctane sulfonamidoacetic acid	MeFOSAA
N-Ethyl perfluorooctane sulfonamidoacetic acid	EtFOSAA
Fluorotelomer Sulfonic Acids	
4:2 Fluorotelomer sulfonic acid	4:2 FTS
6:2 Fluorotelomer sulfonic acid	6:2 FTS
8:2 Fluorotelomer sulfonic acid	8:2 FTS
10:2 Fluorotelomer sulfonic acid	10:2 FTS

3. Assessment criteria

The focus of the Preliminary Sampling is on PFAS, which are regarded as the key contaminants of potential concern for the site.

The following guidelines have been adopted for the soil, sediment, groundwater and surface water assessment for this Preliminary Sampling report:

- *Australian Department of Health 2017, Health Based Guidance Values for PFAS – For use in site investigations in Australia*. Human health screening levels were developed by Food Standards Australia New Zealand (FSANZ) on behalf of the Australian Government Department of Health for concentration of PFOS/PFHxS and PFOA in drinking water and recreational water.
- *GHD (2017).* PFAS Investigation – Derivation of PFAS soil and water criteria (GHD Reference 31\34249\256856). Based on the released interim national guidance on PFAS human health toxicity reference values by FSANZ, GHD derived PFAS criteria to be consistent with the FSANZ toxicity review, for use by Airservices.
- *GHD (2015). Airservices Australia, Managing PFC Contamination at Airports, Interim Contamination Management Strategy and Decision Framework* (GHD Reference 31\32279\239419). GHD has developed a set of interim screening levels (ISLs) for use at federally leased airport sites, based on currently available international guidelines. The ISLs include criteria for of soils, sediments, groundwater and surface water to assess protection of human health (HISLs) and ecosystems (EISLs).

The values for the adopted screening / investigation levels from these sources are summarised in Table 8 and Table 9.

Table 8 Adopted PFAS assessment screening criteria for soil/sediment

SOIL			
Exposure Scenario	PFOS	PFOA / 8:2FtS	Source
Ecological interim screening levels (EISLs) (terrestrial)	0.373 mg/kg (95% protection) 0.91 mg/kg (residential, 80% protection, low reliability) 4.71 mg/kg (commercial / industrial, 60% protection, low reliability)	3.73 mg/kg	GHD, 2015 [UK Environmental Agency 2009]
	PFOS + Perfluorohexane sulfonic acid (PFHxS)	PFOA	Source
Health-based screening criteria (HBSC) – Recreational Public Open Space	6.0 mg/kg	48 mg/kg	GHD, 2017
HBSC - Commercial/Industrial	81 mg/kg	680 mg/kg	GHD, 2017
SOIL (Leachate)			
Due to the absence of PFAS leachate criteria, the soil ASLP-PFAS results will be compared against the adopted surface water and groundwater screening criteria instead.			

Table 9 Adopted PFAS assessment screening criteria for surface water and groundwater

SURFACE WATER				
	PFOS	PFOA / 8:2FtS	6:2FtS	Source
EISLs (toxicity effects on aquatic organisms)	6.66 µg/L	2900 µg/L	NA	Qi et al 2011 Giesy et al 2010
	PFOS + PFHxS		PFOA	Source
Human health interim screening levels (HISLs) (consumption of fish)	1.0 ng/L (marine water)		8.2 ng/L (marine water)	GHD 2017
Recreational water quality value	0.7 µg/L		5.6 µg/L µg/L	Australian Department of Health 2017
GROUNDWATER				
	PFOS	PFOA / 8:2FtS	6:2FtS	Source
EISLs (toxicity effects on aquatic organisms)	6.66 µg/L	2900 µg/L	NA	Qi et al 2011 Giesy et al 2010
	PFOS + PFHxS		PFOA	Source
Drinking water quality value	0.07 µg/L		0.56 µg/L	Australian Department of Health 2017

In most cases, the assessment of ecological impact will relate to the discharge of groundwater to a surface water, and impact on the aquatic ecosystems of the surface water. When assessing risk to surface waters, consideration should be given to the flux of the chemical in groundwater, the resulting dilution that will occur in the surface water and the existing PFAS concentrations in the surface water. This can then be compared to the surface water screening values above. However, in this case, where the groundwater flux to surface water is not understood, the groundwater results are compared to the adopted assessment screening levels above directly without dilution.

4. Results

The following sections summarise the field observations and analytical results of the Preliminary Sampling. Sample locations are shown in Figure 2 of Appendix A. Interpretation and discussion of the results has been provided in Section 6.

4.1 Soil

4.1.1 Field observations

The soil field observations are presented in the borehole logs contained in Appendix B. The general soil types logged at the drilling locations are summarised below in Table 10.

Table 10 Summary of Soil Profile

	Depth (mbgl)	Description
Fill layer	0 – 2.0	Sandy silt, sand, silty sand material with fine to coarse gravel
Natural soil layer	2.0 – 4.5	Sandy clay and silty clay material with fine sand. Medium to coarse sand layers were noticed at GW01 at 2.5 mbgl, at GW05 at 3.0 mbgl and GW06 at 3.8 mbgl

4.1.2 Analytical results

The tabulated analytical results of soil samples are presented in Appendix F and laboratory reports are provided in Appendix H.

Fate and transport indicators

The results of particle size distribution (PSD), physico-chemical parameters, metal/metalloids and minerals provide a snapshot of the environmental mobility of PFAS in the soil.

Particle size distribution

Three soil samples collected at various depth were analysed for particle size distribution (PSD), including GW07-0.5, GW05-2.5 and GW01-3.5. The PSD results indicate an almost equal amount of silt, sand and gravel material near the surface, and sand content appeared to increase as depth increased. The PSD results were consistent with field observations of the soil bores. The PSD results is summarised below:

Table 11 Summary of PSD results

Sample ID	Depth	PSD Results
GW07-0.5	0.5 mbgl	Gravel=36% Sand = 29% Silt =26% Clay = 9%
GW05-2.5	2.5 mbgl	Sand = 43% Silt = 30% Clay = 20 %
GW01-3.5	3.5 mbgl	Sand = 75% Silt = 11% Clay = 10%

Physico-chemical parameters

Ten soil samples were selected for the physico-chemical parameters analysis, and the results are summarised below:

- The soil pH results ranged between pH 4 (GW05-0.5) to pH 9.2 (GW07-0.5), indicating a mixture of extremely acidic and very strongly alkaline soil.
- Electrical conductivity (EC) of the analysed soil samples ranged between 25 µS/cm (GW01-1.5) to 919 µS/cm (GW01-3.0). However, one soil sample (GW07-3.0) was reported with EC at 4160 µS/cm.
- The total organic carbon (TOC) results of the soil samples were very low, ranging from 0.09% (GW02-1.0) to 1.65% (GW01-1.5).
- Cation Exchangeable Capacity (CEC) of the soil samples were generally low, ranging from less than 0.2 meq/100g (GW02-1.0) to 9.8 meq/100g (GW07-3.0), this is likely due to the low clay content and predominantly sandy material in the soil profile.

Metals/Metalloids and minerals

Fourteen soil samples were selected for metal/metalloids and mineral analysis, and the results are summarised below:

- Aluminium results ranged from 1690 mg/kg (GW06-4.0) to 12,400 mg/kg (GW05-0.5)
- Iron concentrations ranged from 3600 mg/kg (GW06-4.0) to 30,600 mg/kg (GW03-1.5)
- Silica (Silicon Dioxide) of the soil bore samples ranged from 571 g/kg (GW03-3.0) to 937 g/kg (GW06-4.0)
- Potassium concentrations in the soil samples ranged from less than 10 mg/kg (GW01-1.5 and GW02-1.0) to 460 mg/kg (GW03-3.0).

PFASs

Thirteen soil samples were selected for PFAS analysis and the results are summarised below:

- All measured concentrations of PFASs of the analysed soil samples were less than the adopted screening criteria.
- Ten out of the 13 soil samples analysed were reported with detectable PFOS concentrations, ranged between 0.0002 mg/kg (GW07-0.5) and 0.357 mg/kg (GW01-1.5)
- Three soil samples from GW01 and GW02 were reported with detectable PFOA concentrations, ranged between 0.0026 mg/kg (GW02-4.0) and 0.0071 mg/kg (GW01-1.5)
- Only one soil sample (GW02-1.0) was reported with detectable 8:2 Fluorotelomer sulfonic acid (FTS) at 0.004 mg/kg
- Six of the analysed soil samples were reported with detectable PFHxS results, ranging from 0.0008 mg/kg (GW03-3.0) to 0.0334 mg/kg (GW01-1.5).

PFAS (ASLP)

Nine of the soil samples were selected for PFAS ASLP analysis, and the results are summarised below:

- Four out of nine soil samples analysed were reported with detectable levels of PFOS concentrations, including GW01-1.5, GW01-3.0, GW03-1.5, GW06-1.5.
- These samples were reported with PFOS+PFHxS (ASLP) results greater than the adopted FSANZ drinking water guideline, human health criteria for fish consumption (Marine waters), with results ranging between 0.17 µg/L (GW01-3.0) and 9.88 µg/L (GW01-1.5)
- One soil sample (GW01-1.5) was reported with PFOS (ASLP) concentration at 8.64 µg/L, exceeding the adopted EISL for toxicity effects on aquatic organisms
- Two of the PFOS+PFHxS (ASLP) results were greater than the adopted FSANZ recreational water guideline
- Two of the PFOA (ASLP) results were reported greater than the adopted human health criteria for fish consumption (Marine waters)
- The LOR for PFOS+PFHxS (ASLP) (0.01 µg/L) and PFOA (ASLP) (0.01 µg) were greater than the adopted HISL for fish consumption (0.001 µg/L and 0.0082 µg/L) and consequently all results are reported as above the adopted guideline level.

4.2 Groundwater

4.2.1 Field observations and parameters

During drilling of the soil boreholes, groundwater was encountered at depths ranging from 1.0 mbgl (GW04) to 2.5 mbgl (GW02). During the groundwater monitoring, the standing water levels (SWLs) of the monitoring wells ranged between 0.686 m (GW03) and 1.730 m below top of casing (bToC) (GW06).

Groundwater field physicochemical parameters (i.e. temperature, DO, pH, ORP and EC) were recorded during the sampling process and results recorded on field purging sheets, which are presented in Appendix D. The groundwater field physicochemical results are also presented in Table 2 in Appendix F, and are summarised as follows:

- The groundwater pH results ranged between pH 4.05 (GW04) to pH 6.69 (GW03) indicating acidic to near neutral groundwater conditions
- Field EC measurements indicated fresh and saline conditions, ranging from 347 µS/cm (EW03) to 74,424 µS/cm (GW03)
- DO readings of the groundwater samples were generally low, ranging from 0.08 mg/L (GW03) to 0.64 mg/L (GW02)
- ORP measurements at most sample locations were negative, indicating a generally chemical reducing groundwater environment, ranging from -138.9 mV (GW01) to 78.8 mV (GW04).

4.2.2 Analytical results

The tabulated analytical results of groundwater samples are provided in Appendix F, and are summarised in the following sections.

Physico-chemical parameters

- TDS results of the groundwater samples were generally consistent with field EC measurements, and ranged from 206 mg/L (EW03) to 53,800 mg/L (GW03).

PFASs

- Seven out of eight groundwater samples reported detectable PFAS concentrations. PFAS concentrations in the sample from monitoring well GW07 were reported less than laboratory LOR (despite the increased LOR due to matrix interferences).
- PFOS concentrations in groundwater samples GW01 and GW02 were reported at 29.6 µg/L and 101 µg/L, which exceeded the adopted EISL for toxicity on aquatic organisms (6.66 µg/L)
- PFOA concentrations at GW01 and GW02, reported at 1.34 µg/L and 6.82 µg/L respectively, have also exceeded the adopted drinking water criteria (0.56 µg/L)
- Six of the groundwater samples reported PFOS+PFHxS concentrations which exceeded the adopted drinking water criteria (0.07 µg/L), ranging between 0.22 µg/L (GW05) and 135 µg/L (GW02).

4.2.3 Groundwater levels and flow direction

Standing water levels (SWL) of the groundwater monitoring wells during this GME ranged between 0.686 m (GW03) and 1.730 m bToC (GW06).

All new monitoring wells (GW01 to GW07) and existing well EW03 were surveyed to m AHD. The survey results were used to calculate groundwater elevations at each monitoring well during gauging. Groundwater elevations were used for the preparation of an inferred groundwater contour plan (Figure 4 in Appendix A).

The surveyed groundwater elevations were calculated to be between -0.348 (GW07) and 1.105 mAHD (GW01). Based on the groundwater contour, groundwater in the central part of site generally flows towards the east, while the northern portion appears to flow to the north-east (towards the Barron River). Groundwater contours around monitoring wells GW05 and GW06 in the north-eastern portion of the site indicate groundwater is flowing to the north-west, towards the Barron River.

4.3 Sediment

4.3.1 Field observations

Sediment samples were collected at the same locations as the surface water. The sediment collected was generally brown clayey silt, with fine sand and trace gravel. No sediment was collected at SW03 as the open drain was a concrete drain with no sediment noted.

4.3.2 Analytical results

Three sediment samples were analysed by the primary lab for the extended PFASs suite. The results are provided in Appendix F.

Physico-chemical parameters

Three sediment samples were analysed for the physico-chemical parameters analysis, and the results are summarised below:

- The pH results ranged between pH 6.9 (SS02) to pH 7.8 (SS01), indicating a generally neutral to slightly alkaline environment.
- Electrical conductivity (EC) of the analysed sediment samples ranged between 2380 µS/cm (SS04) to 4170 µS/cm (SS02), consistent with surface water EC readings (see Section 4.4)
- The total organic carbon (TOC) results of the sediment samples ranged between 0.76 mg/kg (SS01) to 1.67 mg/kg (SS02)
- Cation Exchangeable Capacity (CEC) of the sediment samples ranged from 4.9 meq/100g (SS04) to 18 meq/100g (SS02).

Metals/Metalloids and minerals

The three sediment samples were also analysed for metal/metalloids and minerals, and the results are summarised below:

- Aluminium results ranged from 8690 mg/kg (SS04) to 16,100 mg/kg (SS02)
- Iron concentrations ranged from 14,700 mg/kg (SS04) to 55,800 mg/kg (SS02)
- Silica (Silicon Dioxide) concentrations ranged from 586 g/kg (SS02) to 796 g/kg (SS04)
- Potassium concentrations ranged from less than 170 mg/kg (SS04) to 470 mg/kg (SS02).

PFASs

Sediment PFAS results are summarised below:

- All measured concentrations of PFASs were less than the adopted screening criteria.
- All three sediment samples were reported with detectable PFOS concentrations, ranged between 0.001 mg/kg (SS02 and SS04) and 0.0031 mg/kg (SS01)
- PFOA concentrations of the three soil samples were reported less than laboratory LOR
- Only one sediment sample (SS02) was reported with a detectable PFAS other than PFOS, PFHxS or PFOA, namely perfluorodecanoic acid (PFDA) at 0.0002 mg/kg
- The remaining PFAS concentrations were less than laboratory LOR.

4.4 Surface water

The surface water and sediment field observations are presented in Appendix E.

4.4.1 Field observations and parameters

The surface water samples (SW01 – SW04) collected from the open drains were typically clear to pale yellow, with low turbidity and suspended solids.

Field physico-chemical measurements indicated the following:

- pH readings of the surface water samples ranged between pH 5.92 (SW04) and pH 8.14 (SW02), indicating a slight acidic to alkaline environment
- Field EC measurements of the surface water were generally saline, ranging from 20,613 µS/cm (SW04) to 54,452 µS/cm (SW01).

4.4.2 Analytical results

Four surface water samples were analysed by the primary lab for the extended PFASs suite. The results are provided in Appendix F.

Physico-chemical parameters

- TDS results of the surface water samples were generally consistent with field EC measurements, ranging from 12,800 mg/L (SW04) to 39,100 mg/L (SW01).

PFASs

- Out of the four surface water samples, only SW04 was reported with detectable PFOS concentration (0.1 µg/L)
- The PFOS+PFHxS (sum) concentration in SW04 (0.1 µg/L) exceeded the adopted criteria for fish consumption in marine water (0.001 µg/L)
- The LORs for PFOS+PFHxS (sum) (0.05 µg/L) and PFOA (0.05 µg) were greater than the adopted criteria for fresh water fish consumption.
- All results were below the EISL (toxicity effects in aquatic organisms) and the Australian Government Department of Health recreational water guideline criteria.

5. Quality assurance and quality control

A summary of the Quality Assurance and Quality Control (QA/QC) Data Quality Indicators (DQIs) used for the Preliminary Sampling and an assessment of the compliance of the data set with these QA/QC DQIs is provided in Table 12. Appendix G of this report contains further details of the QA/QC assessment program.

Table 12 Summary of QA/QC Compliance

Item	Objective	Reference	Summary of Results	Compliance
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results		Field observations correspond with the laboratory results	Yes
Calibration of field instruments	Meet calibration specifications	AS4482.1-2005	Calibration certificates included Refer to Appendix I	Yes
Chain of Custody documentation	Completed		Completed in full Refer to Appendix H	Yes
Sample analysis and extraction holding times	Comply with holding times	AS4482.1-2005/NEPM (2013)	All except pH and TDS in surface water samples due to short holding times. Refer to Appendix G	Yes
Sample Preservation	Samples are collected in appropriately preserved containers		All criteria met	Yes
Analysis of intra-laboratory duplicate samples	1 for every 20 samples RPD 30% - 50%	AS4482.1-2005	Refer to Appendix G	Yes
Analysis of inter-laboratory duplicate samples	1 for every 20 samples RPD 30% - 50%	AS4482.1-2005	Refer to Appendix G	Yes. Some exceedances due to sample heterogeneity and different analytical machinery/ method used between the two laboratories

Item	Objective	Reference	Summary of Results	Compliance
Analysis of laboratory method blanks	No contamination of blanks	NEPM (2013)	All analytes were less than the laboratory LOR for ALS	Yes
Analysis of matrix and laboratory control spikes	Recoveries within the laboratory specified recovery limits	NEPM (2013)	Refer to Appendix G	Yes
Analysis of laboratory surrogates	No surrogate recovery outliers	NEPM (2013)	Refer to Appendix G	Yes.
Analysis of laboratory duplicates	Frequencies and Relative Percent Differences (RPDs) within guideline and internal laboratory limits	NEPM (2013)	Refer to Appendix G	Yes

Based on the field and laboratory QA/QC program undertaken, the results indicate that the data was considered to be reasonable and of sufficient quality to meet the data quality objectives for this investigation.

6. Discussion

6.1 Summary of results

The reported PFAS (total) soil results were either less than laboratory LOR or less than the adopted assessment criteria. The highest PFOS concentrations were reported at the fire station workshop (GW01) and near the fire station area (GW02). The PFAS leachate data (based on the limited soil samples analysed in this Preliminary Sampling) indicated that the soils collected at the workshop and near the western boundary of the airport (former foam testing release area), were reported with the highest PFOS+PFHxS results, exceeding the adopted assessment criteria.

Groundwater results show the highest PFOS concentrations were reported near the fire station, workshop and the training ground. Six of the groundwater samples reported PFOS+PFHxS concentrations greater than the adopted drinking water criteria, two of which were fresh groundwater. However, it is unlikely that groundwater is extracted on site or in the vicinity for drinking purposes due to its urbanised setting and the availability of a reticulated water supply. Therefore, the human health risk through drinking water is considered low. Samples from two of the groundwater monitoring wells reported PFOS results greater than the EISL (toxicity for aquatic organisms) – these were located near the fire station and at the workshop. The remaining groundwater samples collected near the northern and eastern boundaries (near Barron River and mangroves area) were less than the adopted EILs.

The PFAS concentrations in the surface water samples were generally less than laboratory LOR. The PFHxS and PFOS (sum) concentration at SW04 was reported at levels greater than the adopted HISLs for fish consumption (for fresh and marine water).

6.2 Sources

Primary potential sources of PFASs include the fire station and training ground. Other sources/uses may include previous training or releases of AFFF due to spills or crash incidents in other parts of the airport (GHD, 2016a).

With the cessation of use of PFAS-containing AFFF, the primary source has been removed. Secondary sources of PFASs remaining at the site include contaminated infrastructure (e.g. concrete pads and drains) as well as residual soil, sediment and groundwater contamination.

Based on the results, the secondary sources of PFAS on site may include the following:

- Grassed paddock located north of the fire station, western boundary of the airport, impacted by PFAS historical released from vehicle testing
- At the fire station workshop

These areas may act as an ongoing secondary sources of PFASs contamination.

6.3 Migration

A summary of the PFASs (and their carbon chain length) found in each media analysed is provided in Table 13.

Table 13 Detectable PFASs in various media

Soil (total)	*C#	Soil (ASLP)	C#	Groundwater	C#	Sediment	#C	Surface water	#C
PFBS	4	PFBS	4	PFBS	4	PFOS	8	PFOS	8
PFPeS	5	PFPeS	5	PFBA	4	PFDA	9		
PFHxA	5	PFPeA	5	PFPeS	5				
PFPeA	5	PFHxA	6	PFPeA	5				
PFHxA	6	PFHpA	6	PFHxA	6				
PFHxS	6	PFHxS	6	PFHpA	6				
PFHpA	6	PFHpS	7	PFHxS	6				
PFHpS	7	PFOS	8	6:2 FTS	6				
PFOA	7			PFHpS	7				
PFOS	8			PFOA	7				
8:2 FtS	8			8:2 FtS	8				
PFNA	8			PFNA	8				
FOSA	8			PFOS	8				
PFDA	9			FOSA	8				
PFUnDA	10			PFDA	9				
PFDS	10			PFDS	10				
10:2 FTS	10								
PFDoDA	11								
PFTrDA	12								

* Perfluorinated carbon chain length

6.3.1 Soil to groundwater

The PFASs present in soil samples (refer to Table 13) ranged from short (four perfluorinated carbons) to long chain (12 perfluorinated carbons), with PFOS being the dominant species present. This is consistent with a PFOS-dominant AFFF product.

PFASs detected in the soil ASLP results indicated a shorter range of perfluorinated carbons, ranging between four to eight perfluorinated carbons. Groundwater results show a wider range of PFAS compounds. The perfluorinated carbon numbers in groundwater samples ranged between four and ten. The differences of PFAS compounds between the groundwater and soil leachate results may be a result of the pH differences, where laboratory leachate analysis was undertaken at neutral pH 7 conditions, while the groundwater on site was slight more acidic (pH 4.05 – pH 6.69).

The lack of the longer chain PFASs in the ASLP results may reflect two properties of PFASs:

- Longer chain PFASs have a greater potential to sorb readily to soil particles than shorter chain compounds
- Longer chain PFASs have lower solubilities than shorter chain compounds

PFASs have been shown to sorb readily to organic material in an aquifer. Analysis of TOC was conducted to assess the relationship between PFASs and TOC. However, due to the generally low TOC results, no correlation was found between the two during this preliminary sampling.

6.3.2 Surface water and sediment

Low detectable PFOS was reported in one of the surface water samples (SW04) collected from the open drains downstream from the former training ground. Due to the shallow groundwater levels, interaction between the groundwater and surface water environment is likely. The nearest groundwater well (GW04) from the surface water location was also reported with low levels of detectable PFASs. Sediment samples have reported with similar PFAS compounds as surface water sample.

6.3.3 Groundwater

The migration of PFASs through an aquifer to a receiving water body is a complex process. Attenuation of PFASs migration at the Cairns Airport is likely to be controlled predominantly by aquifer properties and tidal influences. Biodegradation is not considered a significant attenuation mechanism, particularly for PFOS and PFOA. Moreover, due to the predominantly sandy unconfined aquifer at the site, the hydraulic conductivity of the aquifer is expected to be relatively high.

As discussed above, the sorption capacity of the aquifer may be relatively low at the site, particularly in relation to low organic material found in the soil.

7. Summary

Based on the data reviewed in this study, the following summary is made:

- The primary source (use of AFFF containing PFAS) no longer exists. Secondary sources include residual soil and groundwater contamination, notably at the fire station, workshop, training ground and former foam release area (north of fire station).
- Soil results have reported the highest PFOS concentrations at the fire station workshop (GW01) and near the fire station area (GW02). The total soil results were all reported within the adopted assessment criteria; however, the leachate concentrations exceeded the adopted criteria for fish consumption, drinking water and recreational water guideline and the EISLs for aquatic organisms.
- Groundwater results reported the highest PFOS concentrations near the fire station, workshop and the training ground. Six of the groundwater samples have reported PFOS+PFHxS concentrations greater than the adopted drinking water criteria, two of which were fresh groundwater. As the site is located in an urbanised setting where council water supply is available, it is unlikely that groundwater onsite is extracted for potable purposes. Therefore, the likelihood of human health exposure via drinking water is considered low.
- Two of the groundwater monitoring wells were reported with PFOS results greater than the EISL (toxicity for aquatic organisms), these were located near the fire station and at the workshop. The remaining groundwater samples collected near the northern and eastern boundaries (near Barron River and mangroves area) were all less than the adopted EISLs.
- The PFAS concentrations in the surface water samples were generally less than laboratory LOR. Only one surface water sample was reported with a detectable level of PFOS. Low levels of PFOS were also reported in sediment samples, but these were less than the adopted assessment criteria. It should be noted that the adopted HSLs for fish consumption (fresh and marine water) have assessment criteria that is lower than the laboratory limit of reporting for some PFASs.

8. References

Airports Act 1996.

Airports (Environment Protection) Regulations 1997.

Australian Department of Health 2016, Health Based Guidane Values for PFAS – For use in site investigations in Australia.

Australian Standard AS 4482.1:2005: Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil.

Arcadis, 2016. Environmental fate and effects of poly- and perfluoroalkyl substances (PFAS), report no. 8/16, CONCAWE.

AS/NZS ISO 31000:2009: Risk management - Principles and guidelines.

Australian Commonwealth Work Health and Safety Act 2011.

Commonwealth Work Health and Safety Regulations 2011.

EnHealth, 2016. enHealth Statement: Interim National guidance on human health reference values for per- and poly-fluoroalkyl substances for use in site investigations in Australia.

GHD, 2015. Airservices Australia, Managing PFC Contamination at Airports, Interim Contamination Management Strategy and Decision Framework (GHD Reference 31\32279\239419)

GHD, 2016a. Preliminary Site Investigation, Cairns Airport, Airservices Australia. (GHD Reference 31\34249\252956)

GHD, 2016b. Airservices Australia, Cairns Airport Sampling Analysis and Quality Plan (GHD reference 31/34249\252990)

GHD, 2017. PFAS Investigation – Derivation of PFAS soil and water criteria (GHD Reference 31\34249\256856)

Government of Western Australia, Department of Environmental Regulation (DER), 2016: Interim Guideline on the Assessment and Management of Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS).

Environmental Protection Act 1994 (EP Act)

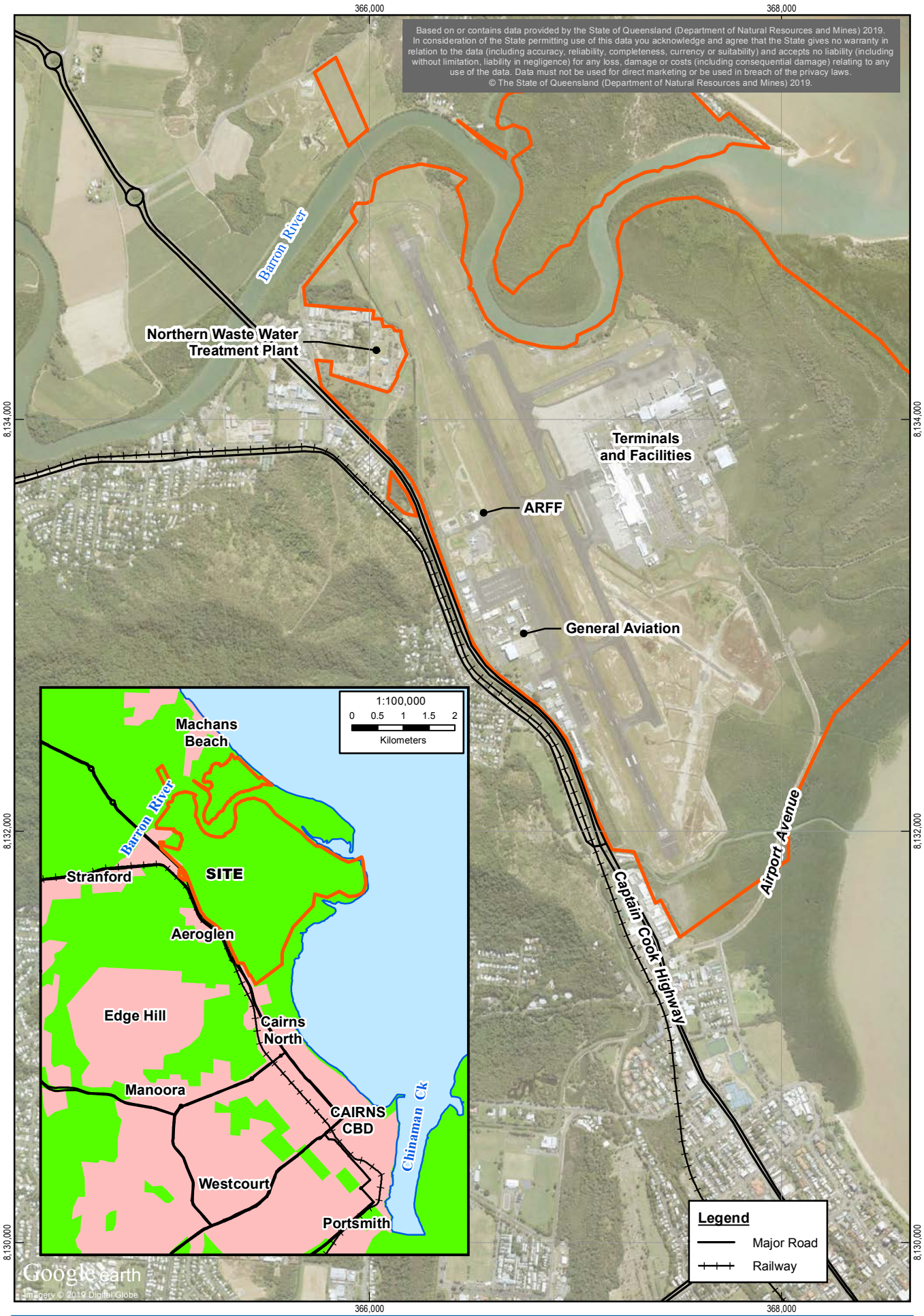
National Environment Protection Council (NEPC), 1999. National Environment Protection (Assessment of Site Contamination) Measure, as amended in 2013 (the ASC NEPM)

Qi P, Wang Y, Mu J and Wang J 2011. Aquatic predicted no-effect-concentration derivation for Perfluorooctane sulfonic acid. Environmental Toxicology and Chemistry. 30(4):836-842

UK Environment Agency 2009. Evidence: Review of human health and environmental risks associated with land application of mechanical-biological treatment outputs (Revision 1) Report: SC030144/R5

Appendices

Appendix A – Figures



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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

airservices

Airservices Australia Pty Ltd
Cairns Airport
Preliminary Site Investigation

Job Number	31-34249
Revision	A
Date	20 Feb 2019

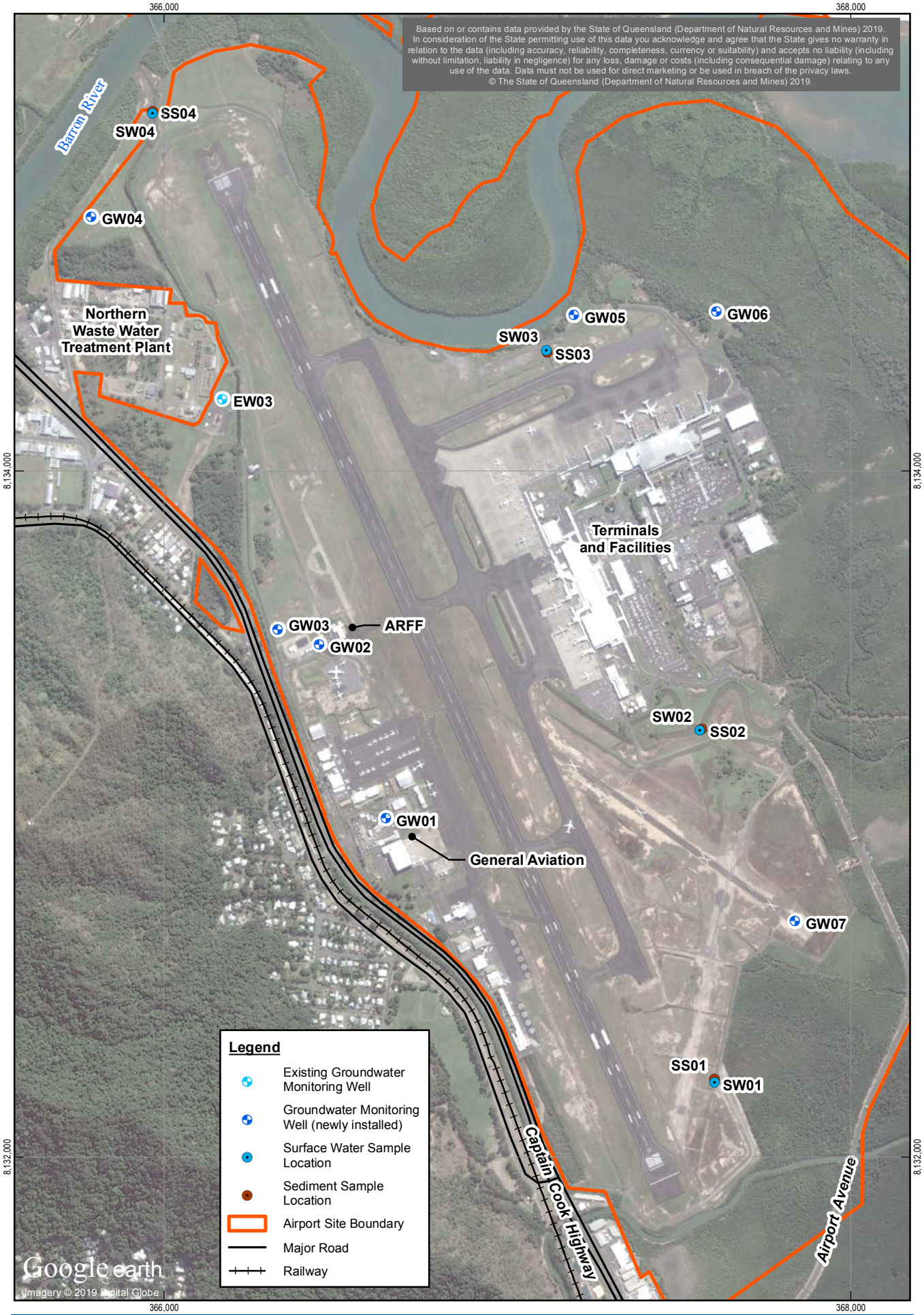
Locality Map

Figure 1

G:\31\34249\GIS\Maps\Working\Cairns\31-34249-201_cairnsLocalityJune2017_revA.mxd

145 Ann Street Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com

Data Source: DMRM: cadastre (2016); Google Earth: imagery (May 2015, extracted Jul 2016). Airservices, site boundary, 2019 Created : jvc



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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

Airservices Australia Pty Ltd
Cairns Airport
PFAS Preliminary Sampling Report

Job Number 31-34249
Revision B
Date 20 Feb 2019

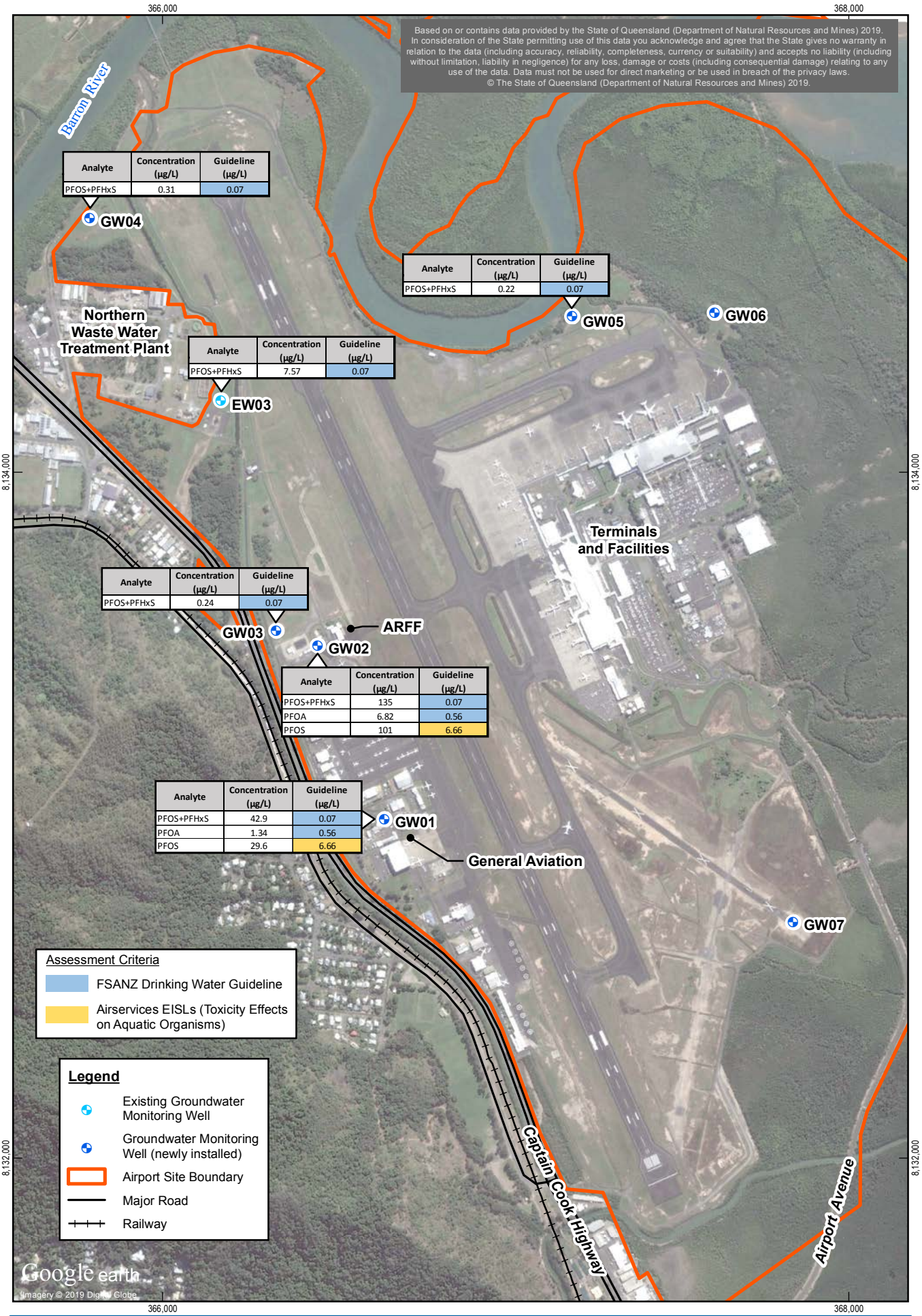
Sample Locations

Figure 2

G:\31\34249\GIS\Maps\Working\Cairns\2019 Airport Boundary Revision\31-34249-202_cairnsSamplingFeb2019_revB.mxd

145 Ann Street Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com

Data Source: DMRM: cadastre (2016); Google Earth: imagery (May 2015, extracted Jul 2016), Airservices: site boundary, 2019. Created : jvc



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Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

Airservices Australia Pty Ltd
Cairns Airport
PFAS Preliminary Sampling Report

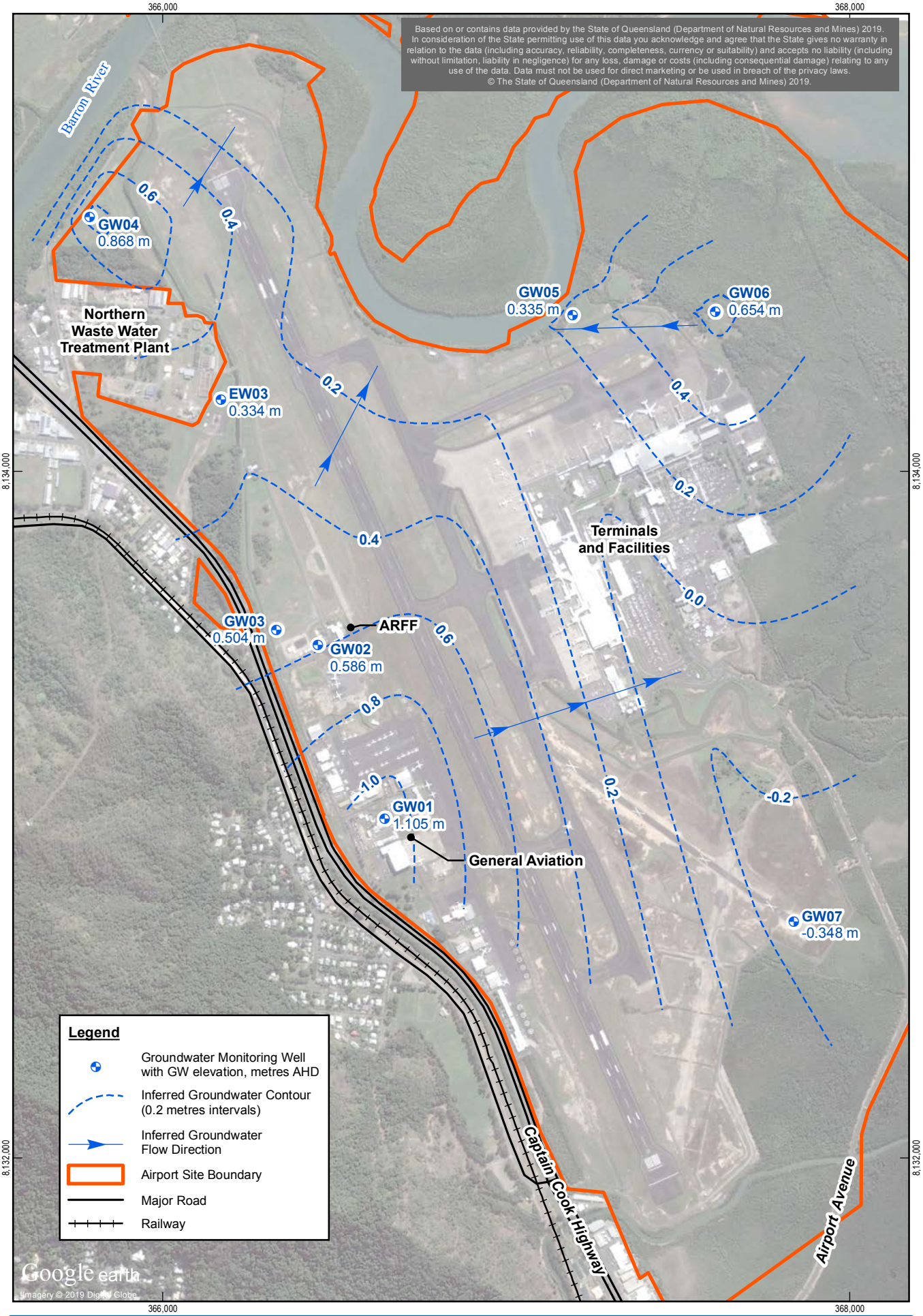
Job Number 31-34249
Revision B
Date 20 Feb 2019

Groundwater Result Exceedances Figure 3

G:\31\34249\GIS\Maps\Working\Cairns\2019 Airport Boundary Revision\31-34249-203_cairnsSamplingResultsFeb2019_revB.mxd

GHD 145 Ann Street Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com

Data Source: DMRM: cadastre (2016); Google Earth: imagery (May 2015, extracted Jul 2016). Created : jvc



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0 200 400 600

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD airservices

Airservices Australia Pty Ltd
Cairns Airport
PFAS Preliminary Sampling Report

Inferred Groundwater Contouring (May 2017)

Job Number 31-34249
Revision B
Date 20 Feb 2019

Figure 4

G:\31\34249\GIS\Maps\Working\Cairns\2019 Airport Boundary Revision\31-34249-204_cairnsGMEMay2017_revB.mxd

145 Ann Street Brisbane QLD 4000 T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com.au W www.ghd.com

Data Source: DMRM: cadastre (2016); Google Earth: imagery (May 2015, extracted Jul 2016), Airservices: site boundary, 2019. Created : jvc

Appendix B – Borehole logs

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL GW01

Client Airservices Australia
Project Airservices Australia - Cairns Airport ARFF PSI
Project No. 313424903
Site Cairns Airport
Location Airport Avenue, Cairns City, QLD 4870
Date Drilled 06/05/2017 - 06/05/2017

Drill Co. Geo Investigate
Driller A.Hallinan
Rig Type Geoprobe D4B-12D
Drill Method SFA
Total Depth (m) 4
Diameter (mm) 150

Easting, Northing 366646, 8132989
Grid Ref GDA94_MGA_zone_55
Elevation 2.206
Collar RL 2.120
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** uPVC **Screen** uPVC Factory Slotted **Surface Completion** Flush Mounted 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	SFA		GW01-0.2		Grout		SANDY SILT, fine sand, brown, trace fine to medium, sub-angular, gravel (FILL)	D/M	L	no odour, no staining	
			GW01-0.5		Bentonite						
0.5							SAND, fine sand, grey brown, with silt (FILL)	D	L	no odour, no staining	-0.5
1							SILT, no PL plasticity, fine sand, brown, with fine sand, clay and trace fine, sub-rounded gravel (FILL)	M	S	no odour, no staining	-1
			GW01-1.5								
1.5							SILTY CLAY, low PL plasticity, dark brown, mottled black, organic matter (NATURAL)	M/W	S	no odour, no staining	-1.5
			GW01-2.0								
2							SANDY CLAY, low PL plasticity, fine to medium sand, grey (NATURAL)	W	S	no odour, no staining	-2
			GW01-2.5		Filter Pack						
2.5							SAND, MC >> PL plasticity, fine to coarse sand, grey, with silt, trace clay (NATURAL)	W	L	no odour, no staining	-2.5
			GW01-3.0 / QA-04								
3							SILTY CLAY, MC >> PL plasticity, grey, with fine sand (NATURAL)	W	VS	no odour, no staining	-3
			GW01-3.5								
3.5							SANDY CLAY, MC >> PL plasticity, medium to coarse sand, grey, with silt (NATURAL)	W	VS	no odour, no staining	-3.5
			GW01-4.0					W	S	no odour, no staining	
4							SILTY CLAY, MC >> PL plasticity, grey (NATURAL)				-4
							Termination Depth at: 4.00 m				
4.5											-4.5
5											-5
5.5											-5.5

Notes In front of workshop

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. 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, 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 GW02

Client Airservices Australia	**Drill Co.** Geo Investigate	**Easting, Northing** 366452, 8133495
Project Airservices Australia - Cairns Airport ARFF PSI	**Driller** A.Hallinan	**Grid Ref** GDA94_MGA_zone_55
Project No. 313424903	**Rig Type** Geoprobe D4B-12D	**Elevation** 1.970
Site Cairns Airport	**Drill Method** SFA	**Collar RL** 1.900
Location Airport Avenue, Cairns City, QLD 4870	**Total Depth (m)** 4.5	**Logged By** BN
Date Drilled 05/05/2017 - 05/05/2017	**Diameter (mm)** 150	**Checked By** TH

B.C.L No. N/A **Casing** uPVC **Screen** uPVC Factory Slotted **Surface Completion** Flush Mounted Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	GW02 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	SFA						GRAVELLY SILTY SAND - ROCK FILL, fine to medium sand, brown, fine to medium gravel (FILL)	D/M	L	no odour, no staining	-0.5
0.5			GW02-0.5		Grout						
							GRAVELLY SILTY SAND - ROCK FILL, fine to medium sand, brown, fine to coarse gravel (FILL)	D/M	L	no odour, no staining	
1			GW02-1.0		Bentonite		GRAVELLY SAND, fine to medium sand, pale brown, fine to medium gravel, with silt (FILL)	D/M	L	no odour, no staining	-1
1.5			GW02-1.5				GRAVELLY SAND, fine to medium sand, brown, fine to medium gravel, with silt (FILL)	D/M	L	no odour, no staining	-1.5
2			GW02-2.0				SANDY CLAY, MC >> PL plasticity, fine sand, grey (NATURAL)	W	S	no odour, no staining	-2
2.5											-2.5
3			GW02-3.0		Filter Pack						-3
3.5											-3.5
4			GW02-4.0								-4
4.5							Termination Depth at: 4.50 m				-4.5
5											-5
5.5											-5.5

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. 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, 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 GW03

Client Airservices Australia	**Drill Co.** Geo Investigate	**Easting, Northing** 366331, 8133538
Project Airservices Australia - Cairns Airport ARFF PSI	**Driller** A.Hallinan	**Grid Ref** GDA94_MGA_zone_55
Project No. 313424903	**Rig Type** Geoprobe D4B-12D	**Elevation** 1.350
Site Cairns Airport	**Drill Method** SFA	**Collar RL** 1.190
Location Airport Avenue, Cairns City, QLD 4870	**Total Depth (m)** 4	**Logged By** BN
Date Drilled 05/05/2017 - 05/05/2017	**Diameter (mm)** 150	**Checked By** TH

B.C.L No. N/A **Casing** uPVC **Screen** uPVC Factory Slotted **Surface Completion** Flush Mounted 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	SFA				Grout		GRAVELLY SILT, fine to coarse gravel, brown, with fine, sub-angular sand (FILL)	M	L	no odour, no staining	0
0.5			GW03-0.5		Bentonite		SILTY SAND, fine, sub-angular sand, grey, with fine to medium, sub-angular gravel (FILL)	M	L	no odour, no staining	-0.5
1			GW03-1.0				SILTY CLAY, medium PL plasticity, grey, fine sand (NATURAL)	M/W	S	no odour, no staining	-1
1.5			GW03-1.5				SILTY CLAY, high PL plasticity, grey, fine sand (NATURAL)	W	S/F	no odour, no staining	-1.5
2			GW03-2.0				SILTY CLAY, MC >> PL plasticity, grey, fine sand (NATURAL)	W	S	no odour, no staining	-2
2.5					Filter Pack						-2.5
3			GW03-3.0								-3
3.5											-3.5
4			GW03-4.0				Termination Depth at: 4.00 m				-4
4.5											-4.5
5											-5
5.5											-5.5

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. 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, 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 GW04

Client Airservices Australia	**Drill Co.** Geo Investigate	**Easting, Northing** 365788, 8134742
Project Airservices Australia - Cairns Airport ARFF PSI	**Driller** A.Hallinan	**Grid Ref** GDA94_MGA_zone_55
Project No. 313424903	**Rig Type** Geoprobe D4B-12D	**Elevation** 2.230
Site Cairns Airport	**Drill Method** SFA	**Collar RL** 2.066
Location Airport Avenue, Cairns City, QLD 4870	**Total Depth (m)** 4	**Logged By** BN
Date Drilled 05/05/2017 - 05/05/2017	**Diameter (mm)** 150	**Checked By** TH

B.C.L No. N/A **Casing** uPVC **Screen** uPVC Factory Slotted **Surface Completion** Flush Mounted 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	SFA				Grout		SANDY SILT, dark brown, fine sand, trace medium sand (FILL)	D/M	L	no odour, no staining	
0.5			GW04-0.5		Bentonite		SANDY SILT, brown, with fine, sub-angular gravel (FILL)	D/M	L	no odour, no staining	-0.5
1			GW04-1.0	▼			SANDY CLAY, low PL plasticity, brown, fine sand, with silt (NATURAL)	W	S	no odour, no staining	-1
1.5			GW04-1.5								-1.5
2			GW04-2.0								-2
2.5					Filter Pack		SILTY CLAY, medium PL plasticity, grey, with fine sand (NATURAL)	W	S/F	no odour, no staining	-2.5
3			GW04-3.0 / QA-01								-3
3.5											-3.5
4			GW04-4.0				Termination Depth at: 4.00 m				-4
4.5											-4.5
5											-5
5.5											-5.5

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. 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, 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 GW05

Client Airservices Australia
Project Airservices Australia - Cairns Airport ARFF PSI
Project No. 313424903
Site Cairns Airport
Location Airport Avenue, Cairns City, QLD 4870
Date Drilled 05/05/2017 - 05/05/2017

Drill Co. Geo Investigate
Driller A.Hallinan
Rig Type Geoprobe D4B-12D
Drill Method SFA
Total Depth (m) 3.5
Diameter (mm) 150

Easting, Northing 367194, 8134455
Grid Ref GDA94_MGA_zone_55
Elevation 2.130
Collar RL 2.033
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** uPVC **Screen** uPVC Factory Slotted **Surface Completion** Flush Mounted 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	SFA		GW05-0.2		Grout		SANDY SILT, fine, sub-angular sand, tan brown, trace fine to medium, sub-angular, gravel (FILL)	D/M	L	no odour, no staining	0
			GW05-0.5								
0.5							SILTY CLAY, medium PL plasticity, brown, mottled orange and yellow, with fine sand (NATURAL)	M	S	no odour, no staining	-0.5
1			GW05-1.0	▽			SANDY CLAY, low PL, MC = PL plasticity, grey, fine sand (NATURAL)	M/W	S	no odour, no staining	-1
1.5			GW05-1.5								-1.5
2			GW05-2.0 / QA-02	▽	Filter Pack						-2
2.5			GW05-2.5								-2.5
3							SAND, MC >> PL plasticity, coarse sand, grey, with silt and clay (NATURAL)	W	L	no odour, no staining	-3
3.5			GW05-3.5				Termination Depth at: 3.50 m				-3.5
4											-4
4.5											-4.5
5											-5
5.5											-5.5

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. 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, 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 GW06

Client Airservices Australia
Project Airservices Australia - Cairns Airport ARFF PSI
Project No. 313424903
Site Cairns Airport
Location Airport Avenue, Cairns City, QLD 4870
Date Drilled 05/05/2017 - 05/05/2017

Drill Co. Geo Investigate
Driller A.Hallinan
Rig Type Geoprobe D4B-12D
Drill Method SFA
Total Depth (m) 4
Diameter (mm) 150

Easting, Northing 367610, 8134466
Grid Ref GDA94_MGA_zone_55
Elevation 2.493
Collar RL 2.384
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** uPVC **Screen** uPVC Factory Slotted **Surface Completion** Flush Mounted 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	SFA		GW06-0.2		Grout		GRAVELLY SILTY SAND, fine to medium sand, tan brown, fine to medium, sub-angular gravel, trace coarse gravel (FILL)	D	L	no odour, no staining	0
0.5			GW06-0.5		Bentonite						-0.5
1			GW06-1.0								-1
1.5			GW06-1.5 / QA-03								-1.5
							SANDY SILT, grey, fine to medium sand, with clay (FILL)	D/M	L	no odour, no staining	
2			GW06-2.0				SILTY CLAY, low PL plasticity, dark grey, with fine sand (NATURAL)	M	F	no odour, no staining	-2
2.5			GW06-2.5		Filter Pack		SANDY CLAY, MC > PL plasticity, grey, fine to coarse sand, with silt (NATURAL)	W	S	no odour, no staining	-2.5
3			GW06-3.0								-3
3.5							SILTY CLAY, low PL, MC >> PL plasticity, grey, with fine sand (NATURAL)	W	S	no odour, no staining	-3.5
							SAND, coarse sand, grey, with silt (NATURAL)	W	L	no odour, no staining	
4			GW06-4.0				Termination Depth at: 4.00 m				-4
4.5											-4.5
5											-5
5.5											-5.5

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, 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 GW07

Client Airservices Australia
Project Airservices Australia - Cairns Airport ARFF PSI
Project No. 313424903
Site Cairns Airport
Location Airport Avenue, Cairns City, QLD 4870
Date Drilled 06/05/2017 - 06/05/2017

Drill Co. Geo Investigate
Driller A.Hallinan
Rig Type Geoprobe D4B-12D
Drill Method SFA
Total Depth (m) 4
Diameter (mm) 150

Easting, Northing 367838, 8132688
Grid Ref GDA94_MGA_zone_55
Elevation 1.020
Collar RL 0.912
Logged By BN
Checked By TH

B.C.L No. N/A **Casing** uPVC **Screen** uPVC Factory Slotted **Surface Completion** Flush Mounted Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	GW07 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	SFA		GW07-0.2		Grout		GRAVELLY SILT, tan brown, grey, coarse to medium, sub-angular gravel, with sand (FILL)	D/M	L	no odour, no staining	0
			GW07-0.5		Bentonite						
0.5							SANDY SILT, tan brown, fine sand, with fine to medium, sub-angular gravel (FILL)	D/M	L	no odour, no staining	-0.5
1			GW07-1.0								-1
1.5							CLAYEY SILT, very low PL plasticity, tan brown, with fine to medium, sub-rounded gravel (FILL)	M	VS	no odour, no staining	-1.5
2			GW07-2.0 / QA-05	▼			SILTY CLAY, medium to high PL plasticity, grey, trace fine sand (NATURAL)	M	S	no odour, no staining	-2
2.5					Filter Pack						-2.5
3			GW07-3.0	▽			SILTY CLAY, medium to high PL plasticity, grey, with fine sand (NATURAL)	W	S	no odour, no staining	-3
3.5											-3.5
4			GW07-4.0 / QA-06				Termination Depth at: 4.00 m				-4
4.5											-4.5
5											-5
5.5											-5.5

Notes

GHD Soil Classifications The GHD Soil Classification is based on Australian Standards AS 1726-1993. 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, 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

Appendix C – Survey data

POZZI SURVEYS

GHD GROUNDWATER WELL LOCATIONS

SURVEY DONE ON 07/07/2017 ZONE 55 AMG COORDINATES

GROUND WATER WELL	EASTING	NORTHING	RL
GW 07 CASING	367842.9	8132685.1	0.912
GW 07 GATTIC LID	367842.9	8132685.1	1.020
GW 06 CASING	367607.3	8134463.1	2.384
GW 06 GATTIC LID	367607.3	8134463.1	2.493
GW 05 CASING	367195.2	8134452.6	2.033
GW 05 GATTIC LID	367195.2	8134452.6	2.130
GW 04 CASING	365789.1	8134739.1	2.066
GW 04 GATTIC LID	365789.1	8134739.1	2.230
EW 03 CASING	366170.5	8134210.5	1.390
EW 03 GROUND LEVEL	366170.5	8134210.5	0.980
GW 03 CASING	366332.0	8133539.6	1.190
GW 03 GATTIC LID	366332.0	8133539.6	1.350
GW 02 CASING	366452.7	8133497.1	1.900
GW 02 GATTIC LID	366452.7	8133497.1	1.970
GW 01 GATTIC LID	366646.6	8132991.1	2.206
GW 01 CASING	366646.5	8132991.1	2.120

Appendix D – Groundwater gauging and purging records

Groundwater Gauging Records

PROJECT DETAILS

Project Number: 3134249	**SWL Meter Type: Interface Probe**
Project Name: Cairns PFAS Investigation	**Date: 22/05/2017**
Location: Cairns Airport	**Sampler:** [redacted]

Location / Bore ID	Easting	Northing	SWL (mbTOC)	Depth of Well (mbTOC)	Time	Comment
GW01	366646	8132989	1.015	4.00	4:14:00 PM	
GW02	366452	8133495	1.314	4.50	12:35:00 PM	
GW03	366331	8133538	0.686	4.00	1:57:00 PM	
EW03	366170	8134210	1.056	5.50	3:00:00 PM	
GW04	365788	8134742	1.198	4.00	8:17:00 AM	
GW05	367194	8134455	1.698	3.50	9:44:00 AM	
GW06	367610	8134466	1.730	4.00	11:10:00 AM	
GW07	367838	8132688	1.260	4.00	2:30:00 PM	

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** GW01
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** GW01
Client: ASA	**Date:** 22/05/2017 16:20
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Gatic	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 1.015	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 4.00	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 1.020	**QA Collected:** -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
16:21	0.0	1.015	0.42	2,085	6.35	-120.1	28.8	Pale yellow, low T/SS
16:26	1.0	1.018	0.17	1,928	6.34	-141.0	28.9	Pale yellow, low T/SS
16:31	1.5	1.020	0.13	1,983	6.35	-127.6	28.8	Pale yellow, low T/SS
16:36	2.0	1.020	0.12	2,018	6.36	-133.0	28.8	Pale yellow, low T/SS
16:41	2.5	1.020	0.10	2,039	6.37	-136.8	28.8	Pale yellow, low T/SS
16:46	3.0	1.020	0.10	2,038	6.36	-138.9	28.8	Pale yellow, low T/SS
16:51	3.5	1.020	0.10	2,049	6.37	-142.6	28.8	Pale yellow, low T/SS (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** GW02
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** GW02
Client: ASA	**Date:** 22/05/2017
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Gatic	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 1.314	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 4.5	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 1.309	**QA Collected:** -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
12:57	0.0	1.315	0.99	21,601	6.55	-70.2	29.5	Pale grey, moderate T/SS, no odour
13:02	0.2	1.316	0.77	20,128	6.56	-77.8	29.5	Pale grey, moderate T/SS, no odour
13:07	0.5	1.32	0.8	18,234	6.55	-49.7	29.3	Pale grey, moderate T/SS, no odour
13:12	1.0	1.322	0.77	16,133	6.53	-42.7	29.2	Pale grey, moderate T/SS, no odour
13:17	1.5	1.322	0.75	14,214	6.51	-42.6	29.2	Pale grey, moderate T/SS, no odour
13:22	2.0	1.322	0.64	13,556	6.50	-40.2	29.0	Pale grey, moderate T/SS, no odour
13:27	2.5	1.322	0.56	13,336	6.50	-37.3	29.0	Pale grey, moderate T/SS, no odour
13:32	3.0	1.322	0.36	12,726	6.50	-37.2	29.1	Pale grey, moderate T/SS, no odour (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** GW03
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** GW03
Client: ASA	**Date:** 22/05/2017 13:58
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Gatic	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 0.686	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 4.00	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 0.720	**QA Collected:** -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
14:04	0.0	0.720	0.31	75,860	6.62	-107.5	30.4	Clear, low T/SS
14:09	0.5	0.720	0.22	74,827	6.66	-100.6	30.5	Clear, low T/SS
14:14	1.5	0.715	0.13	74,370	6.67	-80.5	30.4	Clear, low T/SS
14:19	2.5	0.720	0.10	74,542	6.67	-87.4	30.6	Clear, low T/SS
14:24	3.5	0.720	0.11	74,254	6.68	-94.7	30.1	Clear, low T/SS
14:29	4.5	0.720	0.09	74,268	6.68	-88.4	30.4	Clear, low T/SS
14:34	5.5	0.720	0.08	74,424	6.69	-88.4	30.5	Clear, low T/SS (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** EW03
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** EW03
Client: ASA	**Date:** 22/05/2017
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Monument; lid broken	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 1.056	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 5.50	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 1.060	**QA Collected:** QA-01

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
15:11	0.0	1.060	1.01	5,969.0	7.53	-89.6	29.0	Pale yellow, low T/SS
15:19	1.0	1.060	0.12	3,674.0	7.41	-136.4	28.5	Pale yellow, low T/SS
15:24	1.5	1.060	0.11	1,537.0	6.74	-49.8	28.5	Pale yellow, low T/SS
15:29	2.0	1.060	0.14	575.0	6.15	17.3	28.4	Pale yellow, low T/SS
15:34	2.5	1.060	0.12	386.1	6.02	20.1	28.3	Pale yellow, low T/SS
15:39	3.0	1.060	0.12	363.0	5.97	24.5	28.3	Pale yellow, low T/SS
15:45	4.0	1.060	0.11	347.0	5.88	23.8	28.3	Pale yellow, low T/SS (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** GW04
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** GW04
Client: ASA	**Date:** 23/05/2017 08:17
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Gatic	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 1.198	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 4.00	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 1.240	**QA Collected:** -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
8:25	0.0	1.220	0.59	810	4.55	138.0	28.2	Clear, low T/SS
8:30	0.5	1.230	0.18	809	4.14	156.8	28.8	Clear, low T/SS
8:35	1.0	1.240	0.16	809	4.17	142.0	28.7	Clear, low T/SS
8:40	1.5	1.245	0.15	810	4.14	106.0	28.7	Clear, low T/SS
8:45	2.0	1.245	0.15	808	4.07	104.0	28.6	Clear, low T/SS
8:50	2.5	1.240	0.14	809	4.05	78.8	28.7	Clear, low T/SS (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** GW05
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** GW05
Client: ASA	**Date:** 23/05/2017 09:50
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Gatic	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 1.698	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 3.50	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 1.805	**QA Collected:** -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
9:54	0.0	1.730	0.42	3,604	6.26	6.0	28.3	Clear, nil T/SS
9:59	0.5	1.750	0.18	3,279	6.15	-9.8	28.4	Clear, nil T/SS
10:04	1.0	1.760	0.15	3,270	6.14	-36.9	28.6	Clear, nil T/SS
10:09	1.5	1.765	0.17	3,265	6.14	-53.5	28.5	Clear, nil T/SS
10:14	2.0	1.780	0.13	3,265	6.13	-64.8	28.5	Clear, nil T/SS
10:19	2.5	1.785	0.12	3,263	6.13	-77.4	28.7	Clear, nil T/SS
10:24	3.0	1.805	0.13	3,261	6.13	-81.5	28.7	Clear, nil T/SS (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** GW06
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** GW06
Client: ASA	**Date:** 23/05/2017 11:00
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Gatic	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 1.730	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 4.00	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 1.750	**QA Collected:** QA-02 (Inter-lab)

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
14:42	0.0	1.740	0.46	16,695	6.45	-56.7	28.4	Pale yellow/clear, nil T/SS
11:47	0.5	1.740	0.16	15,387	6.15	-71.4	28.5	Pale yellow/clear, nil T/SS
11:52	1.0	1.740	0.11	15,655	6.13	-77.2	28.6	Pale yellow/clear, nil T/SS
11:57	1.5	1.744	0.12	15,520	6.12	-80.9	28.5	Pale yellow/clear, nil T/SS
12:02	2.0	1.745	0.11	15,457	6.12	-82.5	28.5	Pale yellow/clear, nil T/SS
12:07	2.5	1.750	0.10	15,482	6.12	-84.4	28.5	Pale yellow/clear, nil T/SS (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

GROUNDWATER PURGING AND SAMPLING FIELD SHEET

PROJECT DETAILS	**Borehole ID** GW07
Project Number: 3134249	
Project Name: Cairns PFAS Investigation	**Sample ID:** GW07
Client: ASA	**Date:** 23/05/2017 14:30
Site: Cairns Airport	**Sampler:** [redacted]
Well Condition (i.e road box, locked etc): Gatic	**Purge Method:** Low-Flow
Depth to Water Table Pre-purge (from TOC): 1.260	**Sample Method:** Low-Flow
Depth of PSH (from TOC): -	**Casing Type:** uPVC Class 18
Depth to Bottom of Casing (BOC) from TOC: 4.00	**Well Diameter:** 50 mm
Depth to Water Table Post - purge (from TOC): 1.780	**QA Collected:** -

FIELD PARAMETERS (RECORDED USING *YSI*)

Time	Volume (L)	Depth to Water from TOC(m)	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
14:38	0.2	1.360	0.17	70,774	6.61	-102.4	30.9	Clear, nil T/SS
14:43	0.7	1.470	0.14	70,771	6.61	-114.5	30.8	Clear, nil T/SS
14:48	1.2	1.560	0.13	70,537	6.61	-115.6	30.8	Clear, nil T/SS
14:52	1.7	1.660	0.10	70,769	6.62	-116.0	30.8	Clear, nil T/SS
14:58	2.2	1.780	0.10	70,397	6.54	-117.4	30.7	Clear, nil T/SS (Sample collected)

Comments:

Well Volume Calculation (50mm diameter) 3.8xH (H=height of water column)

Appendix E – Surface water and sediment observation notes

Surface Water / Sediment Field Parameters

PROJECT DETAILS	
Project Number: 3134249	**Sampler:** [redacted]
Project Name: Cairns PFAS Investigation	**Date: 23/5/2017**
Client: ASA	
Site: Cairns Airport	

SURFACE WATER FIELD PARAMETERS (RECORDED USING *YSI*)

Location	D.O (mg/L)	E.C (us/cm)	pH	Redox (mv)	Temp (^{0}C)	Comments
SW01	5.06	54452	7.21	40.5	28.5	Clear / pale yellow, low T/SS
SW02	4.70	43621	8.14	21.3	28.7	Pale yellow, low T/SS
SW03	6.30	42890	6.84	33.4	26.1	Clear, nil T/SS
SW04	4.31	20613	5.92	71.2	26.7	Clear, nil T/SS

SEDIMENT OBSERVATION

Location	Description
SS01	Clayey silt, with fine sand, brown, low plasticity, wet, soft
SS02	Clayey silt, brown, trace fine gravel, trace fine sand, wet, soft, low plasticity
SS03	(no sediment sample, concrete drain)
SS04	Clayey silt, brown, low plasticity, wet, soft

Appendix F – Summary tabulated results

Appendix F
Table 1
Soil and Sediment Results

Airservices Australia
Cairns Airport
Airservices Australia - Cairns Airport ARFF PSI

Table 1.Soil and Sediment Results

					Cations						Exchange Acidity by 1M Potassi	Exchangeable Cations with pre-	Particle Size Analysis																	TOC		
					Exchangeable Aluminium	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Exchange Acidity	Magnesium/Potassium Ratio	Clay (<2 µm)	Silt (2-60 µm)	Sand (0.06-2.00 mm)	Gravel (>2mm)	Cobbles (>6cm)	+75µm	+150µm	+300µm	+425µm	+600µm	+1180µm	+2.36mm	+4.75mm	+9.5mm	+19.0mm	+37.5mm	+75.0mm	Total Organic Carbon	Calcium/Magnesium Ratio	Exchangeable Sodium Percent
					meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	-	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	-	%
EQL					0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0.02	0.1	0.1
Airservices EISLs (terrestrial) - 95% protection																															
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability																															
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability																															
GHD 2017 - Airservices HBSC - Commercial/Industrial																															
GHD 2017 - Airservices HBSC - Recreational Public Open Space																															
Site_ID	**Location Code**	**Sample Depth Range**	**Field_ID**	**Sampled Date**																											
Monitoring Well Soil Bores	GW01	1.3-1.5	GW01 - 1.5	6/05/2017	<0.1	2.9	1.1	0.2	0.2	4.4	<0.1	6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.65	2.6	3.9
		2.8-3	GW01 - 3.0	6/05/2017	-	3	3.5	0.5	1.8	8.9	-	6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.04	0.9	20.9
		3.3-3.5	GW01 - 3.5	6/05/2017	-	-	-	-	-	-	-	-	10	11	75	4	<1	79	78	73	62	40	10	<1	<1	<1	<1	<1	<1	-	-	-
	GW02	0.8-1	GW02 - 1.0	5/05/2017	-	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09	1.4	<0.2
		3.8-4	GW02 - 4.0	5/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.53	-	-
	GW03	1.3-1.5	GW03 - 1.5	5/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.42	-	-
		2.8-3	GW03 - 3.0	5/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.56	-	-
	GW04	1.3-1.5	GW04 - 1.5	5/05/2017	-	1.4	<0.2	<0.2	<0.2	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.24	-	<0.2
		2.8-3	GW04 - 3.0	5/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.54	-	-
	GW05	0.3-0.5	GW05 - 0.5	5/05/2017	3.8	1	2.3	0.3	0.1	8	4.3	6.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.73	0.4	2.1
		1.8-2	GW05 - 2.0	5/05/2017	-	<0.2	1.7	0.3	0.6	2.6	-	5.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.7	<0.2	24.2
		2.3-2.5	GW05 - 2.5	5/05/2017	-	-	-	-	-	-	-	-	20	30	43	7	<1	49	41	28	25	21	13	5	<1	<1	<1	<1	<1	-	-	-
	GW06	1.3-1.5	GW06 - 1.5	5/05/2017	-	<0.2	0.5	<0.2	0.4	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.54	<0.2	45.8
		3.8-4	GW06 - 4.0	5/05/2017	-	0.2	<0.2	<0.2	<0.2	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.22	2.2	<0.2
	GW07	0.3-0.5	GW07 - 0.5	6/05/2017	-	2.3	0.4	<0.2	0.3	3	-	-	9	26	29	36	<1	63	55	50	48	46	41	34	26	7	<1	<1	<1	1.08	5.3	10
		2.8-3	GW07 - 3.0	6/05/2017	-	3.3	3.6	0.6	2.3	9.8	-	6.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.24	0.9	23.7
Sediment	SS01		SS01	23/05/2017	-	0.8	3.1	0.6	2.6	7.2	-	5.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.76	0.3	36.7
	SS02		SS02	23/05/2017	-	4	9.5	1.5	2.9	18	-	6.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.67	0.4	16.3
	SS04		SS04	23/05/2017	-	0.8	2.2	0.3	1.6	4.9	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.88	0.4	32.1
Statistical Summary																															
Number of Results					2	13	13	13	13	13	2	8	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	17	12	13
Number of Detects					1	10	10	8	10	12	1	8	3	3	3	3	0	3	3	3	3	3	3	2	1	1	0	0	0	17	10	10
Minimum Concentration					<0.1	<0.2	<0.2	<0.2	0.1	<0.2	<0.1	5.6	9	11	29	4	<1	49	41	28	25	21	10	<1	<1	<1	<1	<1	<1	0.09	<0.2	<0.2
Minimum Detect					3.8	0.2	0.4	0.2	0.1	0.2	4.3	5.6	9	11	29	4	ND	49	41	28	25	21	10	5	26	7	ND	ND	ND	0.09	0.3	2.1
Maximum Concentration					3.8	4	9.5	1.5	2.9	18	4.3	8	20	30	75	36	<1	79	78	73	62	46	41	34	26	7	<1	<1	<1	1.67	5.3	45.8
Maximum Detect					3.8	4	9.5	1.5	2.9	18	4.3	8	20	30	75	36	ND	79	78	73	62	46	41	34	26	7	ND	ND	ND	1.67	5.3	45.8
Average Concentration						1.5	2.2	0.37	1	5.3		6.5	13	22	49	16	0.5	64	58	50	45	36	21	13	9	2.7	0.5	0.5	0.5	0.76	1.3	17
Median Concentration					1.925	1	1.7	0.3	0.4	4.4	2.175	6.4	10	26	43	7	0.5	63	55	50	48	40	13	5	0.5	0.5	0.5	0.5	0.5	0.7	0.65	16.3
Standard Deviation						1.4	2.6	0.39	1.1	5.1		0.73	6.1	10	24	18	0	15	19	23	19	13	17	18	15	3.8	0	0	0	0.5	1.5	15
Number of Guideline Exceedances					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

#1:GHD 2017. PFAS Investigation - Derivation of PFAS soil criteria
#2:60% species protection

Table 1.Soil and Sediment Results

							Inorganics					Major Ions	Metals																
							DENSITY	Electrical conductivity (lab)	Moisture	pH (Lab)	Silica	Potassium	Aluminium	Arsenic	Cadmium	Chromium (III+VI)	Copper	Iron	Manganese	Zinc	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid
							g/cm3	µS/cm	%	pH Units	g/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							0.01	1	1	0.1	100	10	50	5	1	2	5	50	5	5	0.0002	0.0002	0.0002	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0002
Airservices EISLs (terrestrial) - 95% protection																														
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability																														
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability																														
GHD 2017 - Airservices HBSC - Commercial/Industrial																												81 [#1]		
GHD 2017 - Airservices HBSC - Recreational Public Open Space																												6		
Site_ID	**Location Code**	**Sample Depth Range**	**Field_ID**	**Sampled Date**																										
Monitoring Well Soil Bores	GW01	1.3-1.5	GW01 - 1.5	6/05/2017	-	25	23.9	6	864	<10	4390	7	<1	10	7	6890	155	33	<0.0002	<0.0002	0.0072	<0.0005	<0.0005	<0.0002	0.381	0.0005	0.0334	0.0002
		2.8-3	GW01 - 3.0	6/05/2017	-	919	38.6	9	670	120	11,200	13	<1	28	9	23,700	408	36	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0062	<0.0002	0.0013	<0.0002
		3.3-3.5	GW01 - 3.5	6/05/2017	2.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GW02	0.8-1	GW02 - 1.0	5/05/2017	-	32	7.3	7.9	896	<10	7720	8	<1	14	47	15,900	1040	49	<0.0002	0.0016	0.0027	0.0007	<0.0005	<0.0002	0.371	0.0002	0.0137	0.0022
		3.8-4	GW02 - 4.0	5/05/2017	-	-	29.6	-	734	300	5780	9	<1	19	6	12,200	304	21	<0.0002	<0.0002	0.0017	<0.0005	<0.0005	<0.0002	0.0729	0.002	0.0235	<0.0002
	GW03	1.3-1.5	GW03 - 1.5	5/05/2017	-	-	23.7	-	663	190	12,400	15	<1	27	16	30,600	599	72	<0.0002	<0.0002	0.0007	<0.0005	<0.0005	<0.0002	0.0505	<0.0002	0.0017	<0.0002
		2.8-3	GW03 - 3.0	5/05/2017	-	-	41.4	-	571	460	12,000	23	<1	37	16	29,600	304	62	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0031	<0.0002	0.0008	<0.0002
	GW04	1.3-1.5	GW04 - 1.5	5/05/2017	-	573	20.7	8.8	864	40	4980	<5	<1	14	6	11,200	76	15	-	-	-	-	-	-	-	-	-	-
		2.8-3	GW04 - 3.0	5/05/2017	-	-	26.8	-	757	10	6100	12	<1	20	6	15,600	27	11	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
	GW05	0.3-0.5	GW05 - 0.5	5/05/2017	-	685	20.2	4	744	80	12,400	13	<1	28	13	27,600	164	38	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0012	<0.0002	<0.0002	<0.0002
		1.8-2	GW05 - 2.0	5/05/2017	-	235	23.7	8.2	819	40	7580	8	<1	20	6	12,400	79	22	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
		2.3-2.5	GW05 - 2.5	5/05/2017	2.88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GW06	1.3-1.5	GW06 - 1.5	5/05/2017	-	138	9	7.7	826	<10	8480	8	<1	16	29	17,900	1140	36	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0068	<0.0002	<0.0002	<0.0002
		3.8-4	GW06 - 4.0	5/05/2017	-	100	12.2	7.4	937	50	1690	<5	<1	5	<5	3600	53	8	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
	GW07	0.3-0.5	GW07 - 0.5	6/05/2017	2.83	819	12.9	9.2	667	60	8140	7	<1	11	22	17,400	823	35	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0002	<0.0002	<0.0002	<0.0002
		2.8-3	GW07 - 3.0	6/05/2017	-	4160	34.3	8.6	860	380	9920	16	<1	26	8	20,900	364	31	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0003	<0.0002	<0.0002	<0.0002
Sediment	SS01		SS01	23/05/2017	-	2670	42.8	7.8	687	240	15,100	25	<1	31	24	37,900	1700	69	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.0031	<0.0002	<0.0002	<0.0002
	SS02		SS02	23/05/2017	-	4170	49.8	6.9	586	470	16,100	30	<1	37	20	55,800	324	103	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.001	<0.0002	<0.0002	<0.0002
	SS04		SS04	23/05/2017	-	2380	29.5	7.7	796	170	8690	9	<1	19	10	14,700	245	36	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	0.001	<0.0002	<0.0002	<0.0002
Statistical Summary																														
Number of Results					3	13	17	13	17	17	17	17	17	17	17	17	17	17	16	16	16	16	16	16	16	16	16	16		
Number of Detects					3	13	17	13	17	14	17	15	0	17	16	17	17	17	0	1	4	1	0	0	13	3	6	2		
Minimum Concentration					2.55	25	7.3	4	571	<10	1690	<5	<1	5	<5	3600	27	8	<0.0002	<0.0002	<0.0002	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002		
Minimum Detect					2.55	25	7.3	4	571	10	1690	7	ND	5	6	3600	27	8	ND	0.0016	0.0007	0.0007	ND	ND	0.0002	0.0002	0.0008	0.0002		
Maximum Concentration					2.88	4170	49.8	9.2	937	470	16100	30	<1	37	47	55800	1700	103	<0.0002	0.0016	0.0072	0.0007	<0.0005	<0.0002	0.381	0.002	0.0334	0.0022		
Maximum Detect					2.88	4170	49.8	9.2	937	470	16100	30	ND	37	47	55800	1700	103	ND	0.0016	0.0072	0.0007	ND	ND	0.381	0.002	0.0334	0.0022		
Average Concentration					2.8	1300	26	7.6	761	154	8981	12	0.5	21	15	20817	459	40	0.0001	0.00019	0.00084	0.00028	0.00025	0.0001	0.056	0.00025	0.0047	0.00024		
Median Concentration					2.83	685	23.9	7.8	757	80	8480	9	0.5	20	10	17400	304	36	0.0001	0.0001	0.0001	0.00025	0.00025	0.0001	0.00215	0.0001	0.0001	0.0001		
Standard Deviation					0.18	1525	12	1.4	109	161	3871	7.7	0	9.3	11	12698	464	25	0	0.00038	0.0018	0.00011	0	0	0.13	0.00048	0.01	0.00052		
Number of Guideline Exceedances					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Number of Guideline Exceedances(Detects Only)					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Env Stds Comments

#1:GHD 2017. PFAS Investigation - Derivation of PFAS soil criteria
#2:60% species protection

Table 1.Soil and Sediment Results

	PFAS																				
	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	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	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.001	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0002	0.0002	0.0002
Airservices EISLs (terrestrial) - 95% protection	3.73						3.73								0.373						
Airservices EISLs (terrestrial) - com./ind., 60% protection, low reliability	3.73						3.73								4.71						
Airservices EISLs (terrestrial) - residential, 80% protection, low reliability	**3.73**						**3.73**								**0.91**						
GHD 2017 - Airservices HBSC - Commercial/Industrial							*680* [#1]														
GHD 2017 - Airservices HBSC - Recreational Public Open Space							48														
Site_ID	**Location Code**	**Sample Depth Range**	**Field_ID**	**Sampled Date**																			
Monitoring Well Soil Bores	GW01	1.3-1.5	GW01 - 1.5	6/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0071	0.0027	<0.001	<0.0002	<0.0002	0.0011	0.007	<0.0002	0.348	<0.0002	<0.0005	<0.0002	<0.0002	0.407	0.397
		2.8-3	GW01 - 3.0	6/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0049	<0.0002	<0.0005	<0.0002	<0.0002	0.0065	0.0065
		3.3-3.5	GW01 - 3.5	6/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GW02	0.8-1	GW02 - 1.0	5/05/2017	0.004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0032	0.0009	<0.001	0.0016	0.0019	0.0014	0.0045	0.0004	0.357	0.0018	<0.0005	0.0006	0.0016	0.4	0.386
		3.8-4	GW02 - 4.0	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0026	0.0043	<0.001	<0.0002	<0.0002	0.0011	0.0087	<0.0002	0.0494	<0.0002	<0.0005	<0.0002	<0.0002	0.0933	0.0873
	GW03	1.3-1.5	GW03 - 1.5	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0488	<0.0002	<0.0005	<0.0002	<0.0002	0.0512	0.0505
		2.8-3	GW03 - 3.0	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	0.0023	<0.0002	<0.0005	<0.0002	<0.0002	0.0036	0.0036
	GW04	1.3-1.5	GW04 - 1.5	5/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		2.8-3	GW04 - 3.0	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
	GW05	0.3-0.5	GW05 - 0.5	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.0005	<0.0002	<0.0002	0.0012	0.0012
		1.8-2	GW05 - 2.0	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
		2.3-2.5	GW05 - 2.5	5/05/2017	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GW06	1.3-1.5	GW06 - 1.5	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0068	<0.0002	<0.0005	<0.0002	<0.0002	0.0068	0.0068
		3.8-4	GW06 - 4.0	5/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
	GW07	0.3-0.5	GW07 - 0.5	6/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0005	<0.0002	<0.0002	0.0002	0.0002
		2.8-3	GW07 - 3.0	6/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0005	<0.0002	<0.0002	0.0003	0.0003
Sediment	SS01		SS01	23/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0031	<0.0002	<0.0005	<0.0002	<0.0002	0.0031	0.0031
	SS02		SS02	23/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.001	<0.0002	<0.0005	<0.0002	<0.0002	0.0012	0.001
	SS04		SS04	23/05/2017	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.001	<0.0002	<0.0005	<0.0002	<0.0002	0.001	0.001

Statistical Summary

Number of Results	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Number of Detects	1	0	0	0	0	0	3	3	0	2	1	3	5	1	13	1	0	1	1	13	13
Minimum Concentration	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002
Minimum Detect	0.004	ND	ND	ND	ND	ND	0.0026	0.0009	ND	0.0002	0.0019	0.0011	0.0003	0.0004	0.0002	0.0018	ND	0.0006	0.0016	0.0002	0.0002
Maximum Concentration	0.004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0071	0.0043	<0.001	0.0016	0.0019	0.0014	0.0087	0.0004	0.357	0.0018	<0.0005	0.0006	0.0016	0.407	0.397
Maximum Detect	0.004	ND	ND	ND	ND	ND	0.0071	0.0043	ND	0.0016	0.0019	0.0014	0.0087	0.0004	0.357	0.0018	ND	0.0006	0.0016	0.407	0.397
Average Concentration	0.00048	0.00025	0.00025	0.00025	0.00025	0.00025	0.00089	0.00058	0.0005	0.0002	0.00021	0.00031	0.0014	0.00012	0.052	0.00021	0.00025	0.00013	0.00019	0.061	0.059
Median Concentration	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.0001	0.0001	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.00175	0.0001	0.00025	0.0001	0.0001	0.00215	0.00215
Standard Deviation	0.00094	0	0	0	0	0	0.0019	0.0012	0	0.00037	0.00045	0.00045	0.0028	0.000075	0.12	0.00043	0	0.00013	0.00038	0.14	0.13
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Comments

#1:GHD 2017. PFAS Investigation - Derivation of PFAS soil criteria
#2:60% species protection

Table 2. ASLP - Soil Leach Results

								PFAS																								
								N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)
								µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL								0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01
Airservices - GHD 2017 Human Health Criteira - MW Fish Consumption														0.001										0.0082														
Airservices EISLs (toxicity effects on aquatic organisms)-Leach																		**2900**						**2900**								**6.66**						
FSANZ - PFAS Drinking water quality guideline - Leachate														*0.07*										*0.56*														
FSANZ - PFAS Recreational water quality guideline - Leachate														0.7										5.6														
Site_ID	**Location_Code**	**Sample_Depth_Range**	**Field_ID**	**Sampled_Date_Time**																																				
Cairns Airport	GW01	1.3-1.5	GW01 - 1.5	6/05/2017	<0.02	<0.02	0.18	<0.05	<0.05	<0.02	*9.88*	0.04	1.24	0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	0.08	<0.1	<0.02	<0.02	0.03	0.11	<0.02	**8.64**	<0.02	<0.05	<0.02	<0.02	10.5	10.2
		2.8-3	GW01 - 3.0	6/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	*0.17*	<0.02	0.04	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.13	<0.02	<0.05	<0.02	<0.02	0.17	0.17
	GW03	1.3-1.5	GW03 - 1.5	5/05/2017	<0.02	<0.02	0.08	<0.05	<0.05	<0.02	*5.81*	<0.02	0.26	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	5.55	<0.02	<0.05	<0.02	<0.02	5.91	5.83
	GW04	2.8-3	GW04 - 3.0	5/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
	GW05	0.3-0.5	GW05 - 0.5	5/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
	GW06	1.3-1.5	GW06 - 1.5	5/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	*0.21*	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	0.21	<0.02	<0.05	<0.02	<0.02	0.21	0.21
		3.8-4	GW06 - 4.0	5/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
	GW07	0.3-0.5	GW07 - 0.5	6/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
		2.8-3	GW07 - 3.0	6/05/2017	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
Statistical Summary																																						
Number of Results					9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Number of Detects					0	0	2	0	0	0	4	1	3	1	0	0	0	0	0	0	0	2	1	0	0	0	1	1	0	4	0	0	0	0	4	4
Minimum Concentration					<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.05	<0.02	<0.02	<0.01	<0.01
Minimum Detect					ND	ND	0.08	ND	ND	ND	0.17	0.04	0.04	0.04	ND	ND	ND	ND	ND	ND	ND	0.02	0.08	ND	ND	ND	0.03	0.11	ND	0.13	ND	ND	ND	ND	0.17	0.17
Maximum Concentration					<0.02	<0.02	0.18	<0.05	<0.05	<0.02	9.88	0.04	1.24	0.04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.14	0.08	<0.1	<0.02	<0.02	0.03	0.11	<0.02	8.64	<0.02	<0.05	<0.02	<0.02	10.5	10.2
Maximum Detect					ND	ND	0.18	ND	ND	ND	9.88	0.04	1.24	0.04	ND	ND	ND	ND	ND	ND	ND	0.14	0.08	ND	ND	ND	0.03	0.11	ND	8.64	ND	ND	ND	ND	10.5	10.2
Average Concentration					0.01	0.01	0.037	0.025	0.025	0.01	1.8	0.013	0.18	0.013	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.022	0.018	0.05	0.01	0.01	0.012	0.021	0.01	1.6	0.01	0.025	0.01	0.01	1.9	1.8
Median Concentration					0.01	0.01	0.01	0.025	0.025	0.01	0.005	0.01	0.01	0.01	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.005	0.01	0.05	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.025	0.01	0.01	0.005	0.005
Standard Deviation					0	0	0.059	0	0	0	3.6	0.01	0.41	0.01	0	0	0	0	0	0	0	0.045	0.023	0	0	0	0.0067	0.033	0	3.2	0	0	0	0	3.8	3.7
Number of Guideline Exceedances					0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)					0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0

Env Stds Comments

Table 3. Groundwater Results

				Field Parameters				Inorganics	PFAS																											Alkalinity			
				DO (mg/L) (Field)	Electrical conductivity (field)	pH (Field)	Redox (Field)	Temperature (Field)	Total Dissolved Solids (Filtered)	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3
				mg/L	µS/cm	pH Units	mV	°C	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
EQL									**10**	**0.02**	**0.02**	**0.02**	**0.05**	**0.05**	**0.02**	**0.01**	**0.02**	**0.02**	**0.02**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.05**	**0.01**	**0.02**	**0.1**	**0.02**	**0.02**	**0.02**	**0.02**	**0.02**	**0.01**	**0.02**	**0.05**	**0.02**	**0.02**	**0.01**	**0.01**	**1**	**1**	**1**	**1**
Airservices EISLs (toxicity effects on aquatic organisms)																				2900						2900								6.66									
FSANZ - PFAS Drinking water quality guideline																0.07										0.56																	
Site_ID	**Location_Code**	**Well**	**Sampled_Date_Time**																																								
Cairns Airport	EW03	EW03	22/05/2017	0.11	347	5.88	23.8	28.3	**206**	<0.02	<0.02	**0.21**	<0.05	<0.05	<0.02	**7.57**	**0.2**	**2.34**	**0.18**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.31**	**0.27**	<0.1	<0.02	<0.02	**0.18**	**0.65**	<0.02	**5.23**	<0.02	<0.05	<0.02	<0.02	**9.57**	**9.09**	<1	<1	**48**	**48**
	GW01	GW01	22/05/2017	0.1	2038	6.36	-138.9	28.8	**1030**	<0.02	<0.02	**1.57**	<0.05	<0.05	<0.02	**42.9**	**0.86**	**13.3**	**0.54**	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**1.34**	**1.32**	**0.4**	<0.02	<0.02	**0.38**	**2.37**	<0.02	**29.6**	<0.02	<0.05	<0.02	<0.02	**51.7**	**48.8**	<1	<1	**222**	**222**
	GW02	GW02	22/05/2017	0.64	13,556	6.5	-40.2	29	**6910**	<0.02	**0.03**	**5.17**	<0.05	<0.05	<0.02	**135**	**6.27**	**34.4**	**15.2**	**3.33**	<0.05	<0.05	<0.05	<0.05	**0.82**	**6.82**	**6.55**	**4.5**	**0.1**	<0.02	**4.3**	**20.6**	**0.62**	**101**	**0.27**	<0.05	<0.02	<0.02	**210**	**197**	<1	<1	**314**	**314**
	GW03	GW03	22/05/2017	0.08	74,424	6.69	-88.4	30.5	**53,800**	**<0.05**	**<0.05**	**<0.05**	<0.05	<0.05	**<0.05**	**0.24**	**0.27**	**0.1**	**0.1**	<0.05	**<0.12**	**<0.12**	**<0.12**	**<0.12**	<0.05	**<0.05**	**0.14**	**0.4**	**<0.05**	**<0.05**	**<0.05**	**0.64**	**<0.05**	**0.14**	**<0.05**	**<0.12**	**<0.05**	**<0.05**	**1.79**	**1.65**	<1	<1	**1090**	**1090**
	GW04	GW04	22/05/2017	0.14	809	4.05	78.8	28.7	**585**	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	**0.31**	**0.04**	**0.28**	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	**0.05**	<0.1	<0.02	<0.02	<0.02	**0.03**	<0.02	**0.03**	<0.02	<0.05	<0.02	<0.02	**0.43**	**0.38**	<1	<1	<1	<1
	GW05	GW05	22/05/2017	0.13	3261	6.13	-81.5	28.7	**2010**	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	**0.22**	<0.02	**0.03**	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	**0.19**	<0.02	<0.05	<0.02	<0.02	**0.22**	**0.22**	<1	<1	**298**	**298**
	GW06	GW06	22/05/2017	0.1	15,482	6.12	-84.4	28.5	**9220**	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	**0.04**	<0.02	**0.02**	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	**0.02**	<0.02	<0.05	<0.02	<0.02	**0.04**	**0.04**	<1	<1	**265**	**265**
	GW07	GW07	22/05/2017	0.1	70,397	6.54	-117.4	30.7	**48,800**	**<0.05**	**<0.05**	**<0.05**	<0.05	<0.05	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	<0.05	**<0.12**	**<0.12**	**<0.12**	**<0.12**	<0.05	**<0.05**	**<0.05**	**<0.2**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	**<0.12**	**<0.05**	**<0.05**	**<0.05**	**<0.05**	<1	<1	**1360**	**1360**

Statistical Summary

Number of Results	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Number of Detects	8	8	8	8	8	8	0	1	3	0	0	0	7	5	7	4	1	0	0	0	1	3	5	3	1	0	3	5	1	7	1	0	0	0	7	7	0	0	7	7
Minimum Concentration	0.08	347	4.05	-138.9	28.3	206	<0.02	<0.02	<0.02	<0.05	<0.05	<0.02	0.04	<0.02	0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.05	<0.02	<0.02	0.04	0.04	<1	<1	<1	<1
Minimum Detect	0.08	347	4.05	ND	28.3	206	ND	0.03	0.21	ND	ND	ND	0.04	0.04	0.02	0.1	3.33	ND	ND	ND	ND	0.82	0.31	0.05	0.4	0.1	ND	0.18	0.03	0.62	0.02	0.27	ND	ND	ND	0.04	0.04	ND	ND	48	48
Maximum Concentration	0.64	74424	6.69	78.8	30.7	53800	<0.05	<0.05	5.17	<0.05	<0.05	<0.05	135	6.27	34.4	15.2	3.33	<0.12	<0.12	<0.12	<0.12	0.82	6.82	6.55	4.5	0.1	<0.05	4.3	20.6	0.62	101	0.27	<0.12	<0.05	<0.05	210	197	<1	<1	1360	1360
Maximum Detect	0.64	74424	6.69	78.8	30.7	53800	ND	0.03	5.17	ND	ND	ND	135	6.27	34.4	15.2	3.33	ND	ND	ND	ND	0.82	6.82	6.55	4.5	0.1	ND	4.3	20.6	0.62	101	0.27	ND	ND	ND	210	197	ND	ND	1360	1360
Average Concentration	0.18	22539	6	-56	29	15320	0.014	0.016	0.88	0.025	0.025	0.014	23	0.96	6.3	2	0.44	0.034	0.034	0.034	0.034	0.12	1.1	1	0.7	0.025	0.014	0.62	3	0.09	17	0.046	0.034	0.014	0.014	34	32	0.5	0.5	450	450
Median Concentration	0.105	8408.5	6.245	-82.95	28.75	4460	0.01	0.01	0.025	0.025	0.025	0.01	0.275	0.12	0.19	0.0625	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.095	0.075	0.01	0.01	0.025	0.335	0.01	0.165	0.01	0.025	0.01	0.01	1.11	1.015	0.5	0.5	281.5	281.5
Standard Deviation	0.19	31327	0.84	74	0.92	22477	0.0069	0.0088	1.8	0	0	0.0069	47	2.2	12	5.3	1.2	0.016	0.016	0.016	0.016	0.28	2.4	2.3	1.5	0.031	0.0069	1.5	7.1	0.21	35	0.091	0.016	0.0069	0.0069	73	69	0	0	497	497
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0

Table 4. Surface Water Results

			Inorganics	PFAS																													Alkalinity			
			Total Dissolved Solids (Filtered)	N-Ethyl perfluorooctane sulfonamidoacetic acid	Perfluorodecanesulfonic acid (PFDS)	Perfluoroheptane sulfonic acid	10:2 Fluorotelomer sulfonic acid	4:2 Fluorotelomer sulfonic acid	N-Methyl perfluorooctane sulfonamidoacetic acid	PFHxS and PFOS (Sum of Total) - Lab Calc	Perfluorobutane sulfonic acid	Perfluorohexane sulfonic acid (PFHxS)	Perfluoropentanoic acid	8:2 Fluorotelomer sulfonic acid	N-Ethyl perfluorooctane sulfonamide	N-Ethyl perfluorooctane sulfonamidoethanol	N-Methyl perfluorooctane sulfonamide	N-Methyl perfluorooctane sulfonamidoethanol	6:2 Fluorotelomer Sulfonate (6:2 FTS)	Perfluorooctanoic acid (PFOA)	Perfluoropentane sulfonic acid	Perfluorobutanoic acid	Perfluorodecanoic acid	Perfluorododecanoic acid	Perfluoroheptanoic acid	Perfluorohexanoic acid (PFHxA)	Perfluorononanoic acid	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctane sulfonamide (FOSA)	Perfluorotetradecanoic acid	Perfluorotridecanoic acid	Perfluoroundecanoic acid	PFAS (Sum of Total)	PFAS (Sum of Total)(WA DER List)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide as CaCO3)	Alkalinity (total as CaCO3)	Bicarbonate Alkalinity as CaCO3
			mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L
EQL			10	0.02	0.02	0.02	0.05	0.05	0.02	0.01	0.02	0.02	0.02	0.05	0.05	0.05	0.05	0.05	0.05	0.01	0.02	0.1	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.05	0.02	0.02	0.01	0.01	1	1	1	1
Airservices EISLs (toxicity effects on aquatic organisms)														2900						2900								6.66									
GHD 2017 Airservices PFAS HSLs FW Fish Consumption										**0.0004**										**0.0029**																	
GHD 2017 Airservices PFAS HSLs MW Fish Consumption										0.001										0.0082																	
Australian Government Department of Health - Recreational Waters										*0.7*										*5.6*																	
Site_ID	**Location_Code**	**Sampled_Date_Time**																																			
Cairns Airport	SW01	22/05/2017	39,100	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.05**	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<1	<1	132	132
	SW02	22/05/2017	30,900	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.05**	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<1	<1	191	191
	SW03	23/05/2017	29,900	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**<0.05**	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<1	<1	199	199
	SW04	23/05/2017	12,800	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	**0.1**	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	<0.12	<0.05	<0.05	0.1	0.1	<1	<1	90	90
Statistical Summary																																					
Number of Results			4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Number of Detects			4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	4	4
Minimum Concentration			12800	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<1	<1	90	90
Minimum Detect			12800	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	0.1	0.1	ND	ND	90	90
Maximum Concentration			39100	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.12	<0.12	<0.12	<0.12	<0.05	<0.05	<0.05	<0.2	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	<0.12	<0.05	<0.05	0.1	0.1	<1	<1	199	199
Maximum Detect			39100	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	ND	0.1	0.1	ND	ND	199	199
Average Concentration			28175	0.025	0.025	0.025	0.025	0.025	0.025	0.044	0.025	0.025	0.025	0.025	0.06	0.06	0.06	0.06	0.025	0.025	0.025	0.1	0.025	0.025	0.025	0.025	0.025	0.044	0.025	0.06	0.025	0.025	0.044	0.044	0.5	0.5	153	153
Median Concentration			30400	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.06	0.06	0.06	0.06	0.025	0.025	0.025	0.1	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.06	0.025	0.025	0.025	0.025	0.5	0.5	161.5	161.5
Standard Deviation			11048	0	0	0	0	0	0	0.038	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.038	0	0	0	0	0.038	0.038	0	0	52	52
Number of Guideline Exceedances			0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)			0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix G – QA/QC report

G. Data quality objectives and quality assurance / quality control

G.1 Data quality objectives

The data quality objectives (DQOs) and investigation strategy have been developed using the methodology discussed in NEPM Schedule B (2) *Guideline on Data Collection, Sample Design and Reporting.* The guideline nominates the implementation of the DQO process in Section 5 of AS4482.1-2005. The purpose of the DQO process is to ensure that the data collection activities are focused on collecting the information needed to make decisions, and answering the relevant questions leading up to such decisions.

The Data Quality Objectives (DQOs) establish a framework for contamination investigations which incorporates a seven stepped continuum that defines the problem at the site. A series of stages then optimises the design of the investigation. These are summarised in the Table G-1 below:

Table G-1 Data quality objectives

Step		Description
1	State the problem to be resolved	What is the likelihood that PFAS contamination has migrated off-site via groundwater or surface water?
2	Identify the decision/s to be made	To address the problem set out in Step 1, the following decisions are required to achieve the task objective and to identify data gaps and additional information that may be required: • What are the potential sources of PFAS contamination at the site? • Do the concentrations of PFAS in the samples collected exceed adopted guideline criteria? • Do the results of the groundwater, surface water and soil sampling and analysis indicate there is a potential for off-site PFAS which has originated from the Cairns Airport?
3	Identify the inputs to the decision	To inform the decisions and identify key data gaps and needs, the following information is considered necessary: • The location of potential PFAS contamination sources. • The location of existing groundwater monitoring wells with respect to potential PFAS contamination sources. • Groundwater and surface water flow pathways. • The results of the laboratory analysis of groundwater samples. • The capacity of the aquifer to attenuate migration.
4	Define the boundaries of the study	The study boundary comprises groundwater within the upper (unconfined) aquifer and soil and surface water within the on-site areas in the vicinity of the identified potential PFAS sources as shown in Figure 1. Off-site assessment is not proposed.

Step		Description
5	Develop a decision rule	The key decision rules are: Are PFASs present at concentrations above laboratory level of reporting (LOR) in boundary wells, soil and in surface water? • If NO – there is less potential for PFAS contamination to migrate off-site and the priority for conducting off-site groundwater investigations may be reduced. • If YES – there is potential for PFAS contamination to migrate off-site and the priority for conducting off-site groundwater investigations is increased. AND: Do the concentrations of PFASs in on-site samples exceed the adopted guideline criteria? • If YES – groundwater and surface water off-site is more likely to be contaminated and the priority for conducting off-site groundwater investigations is increased. • If NO – groundwater and surface water *off-site* is less likely to be contaminated and the priority for conducting off-site groundwater investigations may be reduced.
6	Specify the tolerable limits on decision errors	A detailed assessment of potential for sampling and measurement errors will be undertaken based on investigation scope, methodology and results. Data quality will be assessed as detailed in Schedules B2 and B3 of the ASC NEPM. Implications for data quality with respect to the task objective will be identified and discussed. Due to the margin of error associated with analytical methods, any results close to the threshold (within the margin of error either over or under) are more likely to be incorrectly considered either “contaminated” or “uncontaminated”. As targeted samples are to be collected as part of a judgemental approach, greater confidence in results will be achieved through knowledge of the site and the likely location of PFAS sources. As such, the following tolerable limits on decision making are proposed for targeted sampling locations: • For results *within* the margin of error (either above or below the threshold) the initial classification would be considered valid (unless for a chemical not considered to be a contaminant of potential concern). • Any results *above* the threshold would require further investigation and delineation to determine the size of the impact identified.
7	Optimise the design for obtaining the data	The sample design was optimised through: • Identification of potential PFAS sources from existing information and investigations conducted by others. • A preliminary and high level review of the likely hydraulic characteristics of the upper aquifer to estimate the groundwater flow direction and seepage velocities at various locations of the site. • A review of the surface water pathways across and leaving the site. • Installation of targeted monitoring wells. • Collection of surface water samples. • Collection of soil samples from potentially impacted areas. Soils may have the potential to runoff into surface water drains in periods of high rainfall or inundation. • Appropriate laboratory analysis methodologies. • Evaluation and interpretation of results with respect to relevant guidelines.

G.2 Field QA/QC

A series of QA/QC procedures were implemented for the field investigation works, which included:

- Collection of QC Samples
- Use of standard sampling procedures
- Use of standard field sampling forms, including Chain of Custodies (COCs)
- Documenting the calibration and use of field equipment.

All field works were conducted by a GHD environmental scientist in accordance with GHD's *Standard Field Operating Procedures* (SFOP).

G.2.1 QA/QC sampling

Field QA/QC samples were collected and analysed. Field QC sampling was conducted in reference to AS 4482.1: 2005 and NEPM 2013 Schedule B (3) requirements and included the analyses of the following types of samples in Table G-2.

Table G-2 Field QA/QC sample details

Field QA/QC sample type	Details
Intra-Laboratory Duplicate (Blind)	Comprise a single sample that is divided into two separate sampling containers. Both samples are sent anonymously to the primary project laboratory. Blind duplicates provide an indication of the analytical precision of the laboratory, but are inherently influenced by other factors such as sampling techniques and sample media heterogeneity.
Inter-Laboratory Duplicate (Split)	Inter-Laboratory Duplicate (Split) samples are two separate samples collected at the same location and analysed by two separate laboratories to determine the analytical proficiency of the primary laboratory.

GHD adopts the AS4482.1 acceptance criteria of 30% and 50% RPD for field duplicates of inorganics and organics, respectively. Blind duplicate and split samples should have RPDs less than the criteria in each instance. However, it is noted that the criteria will not always be achieved, particularly in heterogeneous materials, or at low analyte concentrations.

In the instance where samples and their corresponding duplicates have concentrations of target analytes less than the laboratory LOR, no quantitative comparison can be carried out and therefore the RPD is undefined. This is also the case for situations where the sample result is less than ten times the laboratory LOR.

Duplicate and split sample results and Relative Percentage Difference (RPD) calculations are presented in Appendix F.

G.2.2 Sample handling and preservation

All soil samples were collected by hand, using single use nitrile gloves between each sample, and placed directly into pre-treated laboratory supplied jars and bags. The samples were placed immediately into a chilled ice box for storage while on site and upon completion of site works the sealed ice box was delivered, via courier, to the laboratory.

Groundwater samples were collected using disposable equipment and transferred to the laboratory-supplied applicable sample bottles. Surface water samples were collected using laboratory supplied applicable sample bottles. Samples were placed directly into the chilled ice box and delivered upon return from site to the laboratory.

All samples were received intact as per the Sample Receipt Notification (included in Appendix H).

G.2.3 Holding Times

All samples were analysed within the laboratory recommended holding times.

G.2.3 Chain of custody

Unique Chain of Custody documentation and distinct batch numbers accompany all sample batches. This documentation is included in Appendix H.

G.3 Laboratory QA/QC

The laboratories subcontracted by GHD to analyse samples (ALS and Eurofins MGT) are certified by the NATA for the required analysis. NATA certification provides for laboratory QA procedures to be in place and to be carried out on an on-going basis.

As part of the NATA requirements, the laboratories carried out and reported analysis of laboratory quality control samples, such as:

- Duplicate samples (the same sample analysed more than once)
- Blanks (containing none of the analytes to be analysed)
- Spiked samples (containing known additions of the analytes to appropriate matrices)
- Standard samples (samples containing known concentrations of the analytes - also known as reference standards).

G.3.1 Laboratory QA/QC procedures

As part of NATA requirements, the laboratories incorporated a range of QA methods to ensure accuracy of data. This includes the analyses of internal laboratory QC samples, details of which have been provided in Table G-3.

Table G-3 Laboratory QC sample details

Laboratory QA/QC sample	Details
Laboratory (Method) Blank	Usually an organic or aqueous solution that is as free as possible of analytes of interest to which is added all the reagents, in the same volume, as used in the preparation and subsequent analysis of the samples. The reagent blank is carried through the complete sample preparation procedure and contains the same reagent concentrations in the final solution as in the sample solution used for analysis. The reagent blank is used to correct for possible contamination resulting from the preparation or processing of the sample.
Laboratory Control Sample	A reference standard of known concentration is analysed along with a batch of samples. The Laboratory Control Sample provides an indication of the analytical accuracy and the precision of the test method and is used for inorganic analyses.
Laboratory Spike	An authentic field sample is 'spiked' by adding an aliquot of known concentration of the target analyte(s) prior to sample extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques. Spiked samples will be analysed for each batch where samples are analysed for organic chemicals of concern.

Laboratory QA/QC sample	Details
Surrogate Samples	These are organic compounds which are similar to the analyte of interest in terms of chemical composition, extractability, and chromatographic conditions (retention time), but which are not normally found in environmental samples. These surrogate compounds are 'spiked' into blanks, standards and samples submitted for organic analyses by gas-chromatographic techniques prior to sample extraction. Surrogate Standard / Spikes provide a means of checking that no gross errors have occurred during any stage of the test method leading to significant analyte loss.
Laboratory Duplicates	The analytical laboratory collects duplicate sub samples from one sample submitted for analytical testing at a rate equivalent to one in twenty samples per analytical batch, or one sample per batch if less than twenty samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the test result. The precision of analysis performed by the laboratory is determined by the calculation of the relative percent difference (RPD). The RPD is calculated based on a comparison of an intra-laboratory split of the sample material with results representing the percent difference between the two sample concentrations for a specific contaminant. The RPD is calculated using the following formula: $RPD(\%) = \frac{\lvert C_o - C_d \rvert}{C_o + C_d} \times 200$ Where Co = Analyte concentration of the original sample Cd = Analyte concentration of the duplicate sample

The laboratory is required to provide this information to GHD. The individual analytical laboratories conduct an assessment of the laboratory QC program internally; however, the results are also reviewed and assessed by GHD.

G.4 Field QC results

The field QC results discussion below considered all the soil, groundwater and surface water samples collected as part of the investigation stage for the SCA site.

G.4.1 Soil

A total of 56 soil samples were collected and 19 were analysed during the site sampling program. Six soil QC samples (including three intra-laboratory and three inter-laboratory samples) were collected and four were analysed as part of the field work program. The target frequency for collection and analysis of field QC samples is 1 in 20 (5%). In this instance, this frequency was achieved for analysis (21%) and collection (11%).

RPDs were calculated between the duplicate results. Field QC samples collected are provided in the Table G-4.

Table G-4 Analysed field QC samples for soil

QA sample ID	QA/QC sample	Primary sample
QA-01	Intra-laboratory	GW04-3.0
QA-02	Inter-laboratory	GW05-2.0
QA-03	Intra-laboratory	GW06-1.5
QA-04	Inter-laboratory	GW01-3.0

All RPD results were within the adopted data quality objectives.

G.4.2 Groundwater/surface water

A total of 12 water samples (groundwater and surface water) were submitted as part of the groundwater and surface water investigations at the Cairns Airport.

Two QC samples (one intra-laboratory and one inter-laboratory) were collected and analysed as part of the investigation. The target frequency for analysis of field QC samples is 1 in 20 (5%). In this instance, this frequency was achieved for analysis (17%).

The field QC sample collected are provided in the Table G-5.

Table G-5 Analysed field QC samples for groundwater/surface water

QA sample	QA/QC sample	Primary sample
QA-01	Intra-laboratory	EW03
QA-02	Inter-laboratory	GW06

All RPD results were within the adopted data quality objectives.

G.5 Laboratory program

The NATA certified laboratories utilised for this assessment (ALS and Eurofins MGT) undertook their own internal quality assurance and quality control procedures for sample analysis. GHD has reviewed the internal laboratory control data provided within the laboratory reports, which are provided in Appendix H.

All of the internal laboratory QA QC analysis, including method blanks, control samples, laboratory spikes and surrogates spikes was within the data quality criteria, however some matrix spikes outliers were reported, as summarised below in Table G-6. The outliers reported were mostly due to matrix interferences of the samples, where background levels were greater than spike levels, instead of poor laboratory handling. As a result, the results of this preliminary sampling are considered to be valid and of sufficient quality.

Table G-6 Matrix spike recovery outliers

Laboratory Reports	Sample ID	Analytes	Comment
Soil Samples			
EB1709304	Anonymous	Manganese	Matrix spike not determined, background level greater than or equal to 4 times spike level
	GW01-1.5	PFHxS PFHpS PFOS PFHxA PFOA	Matrix spike not determined, background level greater than or equal to 4 times spike level
EB1710666	SS01	Manganese	Matrix spike not determined, background level greater than or equal to 4 times spike level
		Zinc	Recovery greater than upper data quality objective
Water			
EB1710666	GW01	PFHxS PFOS PFHxA	Matrix spike not determined, background level greater than or equal to 4 times spike level

G.6 Overall assessment of data quality

With the exception of the non-conformances listed above, the majority of the GHD QA/QC parameters were within the specified requirements, therefore the data is considered to be valid and of sufficient quality for the purposes of this Preliminary Sampling report.

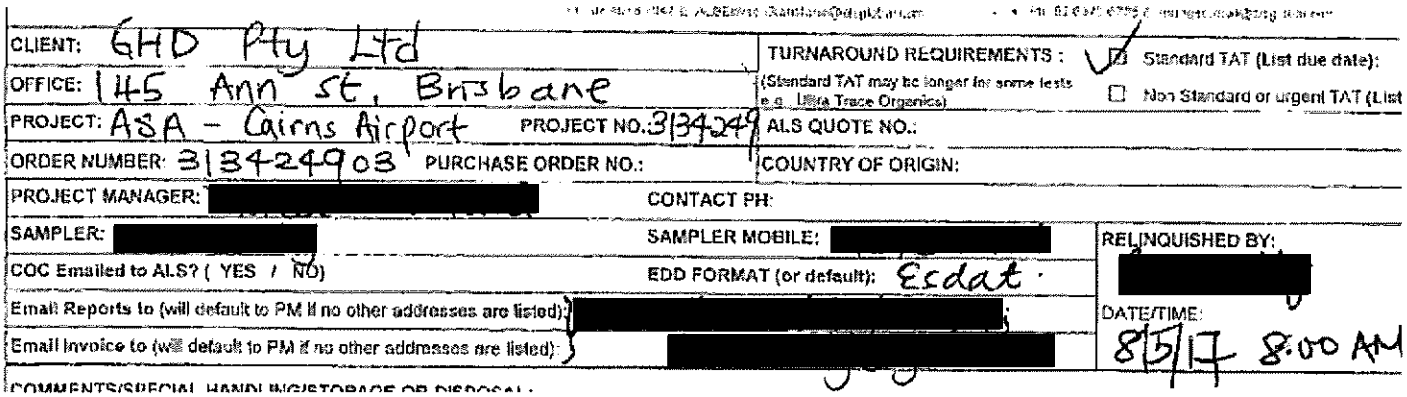
Appendix H – Laboratory reports

Ryan Gilbert

From: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>
Sent: Wednesday, 10 May 2017 11:35 AM
To: Ryan Gilbert
Subject: RE: ASA GHD Triplicates

Thank you Ryan,

Contact details as per below.



CLIENT: GHD Pty Ltd		TURNAROUND REQUIREMENTS : ☑ Standard TAT (List due date):	
OFFICE: 145 Ann St, Brisbane		(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List	
PROJECT: ASA - Cairns Airport	PROJECT NO.: 3134249	ALS QUOTE NO.:	
ORDER NUMBER: 3134249 03	PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	
PROJECT MANAGER: [redacted]	CONTACT PH:		
SAMPLER: [redacted]	SAMPLER MOBILE: [redacted]	RELINQUISHED BY: [redacted]	
COC Emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		
Email Reports to (will default to PM if no other addresses are listed): [redacted]		DATE/TIME: 8/5/17 8:00 AM	
Email Invoice to (will default to PM if no other addresses are listed): [redacted]			
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:			

Regards,

John Pickering
Client Services - Brisbane
Environmental

T +61 7 3243 7222 D +61 7 3552 8634
john.pickering@alsglobal.com
2 Byth Street (cnr Shand & Byth Street)
Stafford QLD 4053
AUSTRALIA

From: Ryan Gilbert [mailto:RyanGilbert@eurofins.com]
Sent: Wednesday, 10 May 2017 11:27 AM
To: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>
Subject: RE: ASA GHD Triplicates

My appologies.

Kind Regards

Ryan Gilbert
Phone : +61 7 3902 4610
Mobile: +61 499 404 007
Email : RyanGilbert@Eurofins.com

From: ALSEnviro Brisbane [mailto:ALSEnviro.Brisbane@alsglobal.com]
Sent: Wednesday, 10 May 2017 11:25 AM
To: Ryan Gilbert
Subject: RE: ASA GHD Triplicates

Hi Ryan there was no attachment.

Regards,

John Pickering
Client Services - Brisbane
Environmental

T +61 7 3243 7222 D +61 7 3552 8634
john.pickering@alsglobal.com
2 Byth Street (cnr Shand & Byth Street)
Stafford QLD 4053
AUSTRALIA

From: Ryan Gilbert [mailto:RyanGilbert@eurofins.com]
Sent: Wednesday, 10 May 2017 11:20 AM
To: ALSEnviro Brisbane <ALSEnviro.Brisbane@alsglobal.com>
Subject: ASA GHD Triplicates

Good Morning,

Please forward the detail of the client contacts for the attached triplicate COC which was received in Eurofins Brisbane.

The relevant jars are labelled ASA-Cairns (GHD)

Kind Regards

Ryan Gilbert
Analytical Service Manager/Laboratory Supervisor - QLD

Eurofins | mgt
1/21 Smallwood Place
MURARRIE QLD 4172
AUSTRALIA
Phone : +61 7 3902 4610
Mobile : +61 499 404 007

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8162 5130 E: adelaide@alsglobal.com
☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Gladstone QLD 4680 Ph: 07 4978 7944 E: ALSEnviro.Gladstone@alsglobal.com
☐MACKAY Unit 2/29 Caterpillar Drive Paget QLD 4740 Ph: 07 4952 6795 E: ALSEnviro.Mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com
☐WOLLONGONG 1/19-21 Ralph Black Drive North Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT:		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) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT:	PROJECT NO.:	ALS QUOTE NO.: / COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:	PURCHASE ORDER NO.:	COUNTRY OF ORIGIN: / COC: 1 2 3 4 (5) 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER:	CONTACT PH:	OF: 1 2 3 4 (5) 6 7	Other comment:

SAMPLER:	SAMPLER MOBILE:	RELINQUISHED BY:	RECEIVED BY: Cameron	RELINQUISHED BY: D.BRADLEY	RECEIVED BY:
COC Emailed to ALS? (YES / NO)	EDD FORMAT (or default):				
Email Reports to (will default to PM if no other addresses are listed):		DATE/TIME:	DATE/TIME: 9/5/17 840	DATE/TIME: 10/5/17 @8:15	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed):					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	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 BOTTLES	PFAS extended suite	Total organic carbon (TOC)	CEC (pH depend)	Metals *	PSD + % clay	Potassium	Silica	ASLP-PFAS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. * Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
	QA-02	5/5/17	S			✓								→ Forward to Eurofins
	QA-03	5/5/17	|			✓								
	QA-04	6/5/17	|			✓	~~✓~~	~~✓~~	~~✓~~		~~✓~~	~~✓~~		→ Forward to Eurofins
	QA-05	6/5/17	|											
	QA-06	6/5/17	|											
								E CN HD	# CON NOTES	POST CODE				Ch 10/5
								AP (CR)		MASS				11:15 am
														5°C.
				TOTAL										

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; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

eurofins | mgt

Melbourne
3-5 Kingston Town Close
Oakleigh Vic 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 18217

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name: **GHD Pty Ltd QLD**

Contact name: [redacted]
Project name: ASA_CAIRNS AIRPORT
Project ID: 3134249
COC number: Not provided
Turn around time: 5 Day
Date/Time received: May 10, 2017 11:15 AM
Eurofins | mgt reference: **545528**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 5 degrees Celsius.

☑ 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.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Mary Makarios on Phone : +61 3 8564 5000 or by e.mail: MaryMakarios@eurofins.com

Results will be delivered electronically via e.mail to [redacted]

eurofins | mgt

ABN– 50 005 085 521
e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

Melbourne
2-5 Kingston Town Close
Oakleigh VIC 3166
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: ASA_CAIRNS AIRPORT
Project ID: 3134249

Order No.:
Report #: 545528
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: May 10, 2017 11:15 AM
Due: May 17, 2017
Priority: 5 Day
Contact Name: [redacted]

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Moisture Set	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 18217							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QA_02	May 05, 2017		Soil	B17-My09400	X	X
2	QA_04	May 06, 2017		Soil	B17-My09401	X	X
Test Counts						2	2

eurofins | mgt

Certificate of Analysis

GHD Pty Ltd QLD
145 Ann Street
Brisbane
QLD 4000

Attention: [redacted]

Report **545528-S**
Project name ASA_CAIRNS AIRPORT
Project ID 3134249
Received Date May 10, 2017

Client Sample ID			**QA_02**	**QA_04**
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**B17-My09400**	**B17-My09401**
Date Sampled			**May 05, 2017**	**May 06, 2017**
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
Perfluorobutanoic acid (PFBA)	5	ug/kg	< 5	< 5
Perfluoropentanoic acid (PFPeA)	5	ug/kg	< 5	< 5
Perfluorohexanoic acid (PFHxA)	5	ug/kg	< 5	< 5
Perfluoroheptanoic acid (PFHpA)	5	ug/kg	< 5	< 5
Perfluorooctanoic acid (PFOA)	5	ug/kg	< 5	< 5
Perfluorononanoic acid (PFNA)	5	ug/kg	< 5	< 5
Perfluorodecanoic acid (PFDA)	5	ug/kg	< 5	< 5
Perfluoroundecanoic acid (PFUnA)	5	ug/kg	< 5	< 5
Perfluorododecanoic acid (PFDoA)	5	ug/kg	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)	5	ug/kg	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)	5	ug/kg	< 5	< 5
13C4-PFBA (surr.)	1	%	72	66
13C5-PFPeA (surr.)	1	%	77	59
13C5-PFHxA (surr.)	1	%	77	64
13C4-PFHpA (surr.)	1	%	76	62
13C8-PFOA (surr.)	1	%	84	68
13C5-PFNA (surr.)	1	%	90	81
13C6-PFDA (surr.)	1	%	103	99
13C2-PFUnDA (surr.)	1	%	118	118
13C2-PFDoDA (surr.)	1	%	107	105
13C2-PFTeDA (surr.)	1	%	121	119
Perfluoroalkane sulfonamides (PFASAs)				
Perfluorooctane sulfonamide (FOSA)	5	ug/kg	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	5	ug/kg	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	5	ug/kg	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	5	ug/kg	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	5	ug/kg	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	10	ug/kg	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	10	ug/kg	< 10	< 10
13C8-FOSA (surr.)	1	%	87	86
D3-N-MeFOSA (surr.)	1	%	129	138
D5-N-EtFOSA (surr.)	1	%	354	360
D7-N-MeFOSE (surr.)	1	%	119	124

Client Sample ID			QA_02	QA_04
Sample Matrix			**Soil**	**Soil**
Eurofins | mgt Sample No.			**B17-My09400**	**B17-My09401**
Date Sampled			**May 05, 2017**	**May 06, 2017**
Test/Reference	LOR	Unit		
Perfluoroalkane sulfonamides (PFASAs)				
D9-N-EtFOSE (surr.)	1	%	121	120
D5-N-EtFOSAA (surr.)	1	%	136	138
D3-N-MeFOSAA (surr.)	1	%	188	181
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				
Perfluorobutanesulfonic acid (PFBS)	5	ug/kg	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)	5	ug/kg	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)	5	ug/kg	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)	5	ug/kg	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)[N11]	5	ug/kg	< 5	< 5
Perfluorodecanesulfonic acid (PFDS)	5	ug/kg	< 5	< 5
13C3-PFBS (surr.)	1	%	80	72
18O2-PFHxS (surr.)	1	%	93	89
13C8-PFOS (surr.)	1	%	103	103
n:2 Fluorotelomer sulfonic acids				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	10	ug/kg	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	5	ug/kg	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	5	ug/kg	< 5	< 5
13C2-4:2 FTS (surr.)	1	%	45	22
13C2-6:2 FTS (surr.)	1	%	58	29
13C2-8:2 FTS (surr.)	1	%	102	73
% Moisture	1	%	30	43

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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 Polyfluorinated Alkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	May 10, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonamides (PFASAs)	Brisbane	May 10, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)	Brisbane	May 10, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
n:2 Fluorotelomer sulfonic acids	Brisbane	May 10, 2017	180 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
% Moisture	Brisbane	May 10, 2017	14 Day
- Method: LTM-GEN-7080 Moisture			

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Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: ASA_CAIRNS AIRPORT
Project ID: 3134249

Order No.:
Report #: 545528
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: May 10, 2017 11:15 AM
Due: May 17, 2017
Priority: 5 Day
Contact Name: [redacted]

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Moisture Set	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271							
Sydney Laboratory - NATA Site # 18217							
Brisbane Laboratory - NATA Site # 20794						X	X
Perth Laboratory - NATA Site # 18217							
External Laboratory							
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**		
1	QA_02	May 05, 2017		Soil	B17-My09400	X	X
2	QA_04	May 06, 2017		Soil	B17-My09401	X	X
Test Counts						2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. 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 Sample Receipt Advice.

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.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
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 (PFUnA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
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							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	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							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	113			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	110			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	118			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	112			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	113			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	117			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	108			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	102			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	129			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	103			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	119			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctane sulfonamide (FOSA)	%	117			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	110			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	107			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	126			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	116			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	105			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	73			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	123			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	110			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	101			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	104			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	115			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	113			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	112			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	115			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	%	122			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	%	126			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)	M17-My13520	NCP	%	115			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M17-My13520	NCP	%	114			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M17-My13520	NCP	%	123			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M17-My13520	NCP	%	122			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M17-My13520	NCP	%	115			50-150	Pass	
Perfluorononanoic acid (PFNA)	M17-My13520	NCP	%	122			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M17-My13520	NCP	%	125			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	M17-My13520	NCP	%	102			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	M17-My13520	NCP	%	127			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M17-My13520	NCP	%	94			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M17-My13520	NCP	%	122			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonamides (PFASAs)				Result 1					
Perfluorooctane sulfonamide (FOSA)	M17-My13520	NCP	%	114			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M17-My13520	NCP	%	124			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M17-My13520	NCP	%	111			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M17-My13520	NCP	%	127			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M17-My13520	NCP	%	119			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M17-My13520	NCP	%	93			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M17-My13520	NCP	%	74			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorobutanesulfonic acid (PFBS)	M17-My13520	NCP	%	126			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M17-My13520	NCP	%	139			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M17-My13520	NCP	%	110			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M17-My13520	NCP	%	131			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M17-My13520	NCP	%	120			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M17-My13520	NCP	%	104			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids				Result 1					
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	M17-My13520	NCP	%	110			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	M17-My13520	NCP	%	110			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	M17-My13520	NCP	%	107			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)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B17-My11430	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonamides (PFASAs)				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B17-My11430	NCP	ug/kg	< 10		<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B17-My11430	NCP	ug/kg	< 10		<1	30%	Pass	

Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	B17-My11430	NCP	ug/kg	< 5		27	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	B17-My11430	NCP	ug/kg	< 10		<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	B17-My11430	NCP	ug/kg	< 5		<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	B17-My03561	NCP	%	17	15	9.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
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. 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

Mary Makarios	Analytical Services Manager
Bryan Wilson	Senior Analyst-Metal (QLD)
Jonathon Angell	Senior Analyst-Inorganic (QLD)
Jonathon Angell	Senior Analyst-Organic (QLD)

Glenn Jackson

National Operations 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.

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5630 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 24 Woerdall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 2735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com

CANBERRA 4/11 Geary Place North Fyshwick NSW 2541 Ph: 02 6423 2063 E: canberra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

Environmental Division Brisbane

Work Order Reference

EB1710666

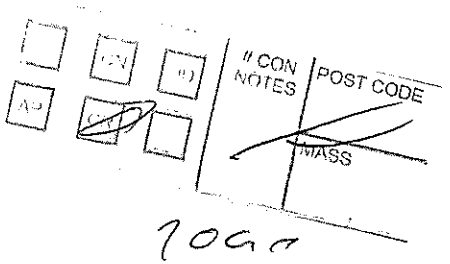
Telephone : +61-7-3243 7222

CLIENT: GHD Pty Ltd	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 LABOR: Custody Seal I…
OFFICE: Brisbane			Free ice / froze… receipt?
PROJECT: ASA	ALS QUOTE NO.: GHD national quote 2016 /2017.	COC SEQUENCE NUMBER (Circle) COC: (1) 2 3 4 5 6 7	Random Samp…
ORDER NUMBER: 3134249		OF: 1 (2) 3 4 5 6 7	Other commen…
PROJECT MANAGER: [redacted]	CONTACT PH [redacted]		
SAMPLER: [redacted]	SAMPLER MOBILE: [redacted]	RELINQUISHED BY: [redacted] DATE/TIME: 24/5/17	RECEIVED BY: DAN DATE/TIME: 25/5/17 8:05
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		RELINQUISHED B: D. BRADLEY DATE/TIME: 26/5/17 8:15
Email Reports to (will default to PM if no other addresses are listed): Bernice.Ng@ghd.com; Therese.Hammond@ghd.com			
Email Invoice to (will default to PM if no other addresses are listed): Therese.Hammond@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 Full Suite.	Major Ions, alkalinity	Total Dissolved Solids						Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	GW01	22/5/17	W		2	✓	✓	✓						
2	GW02	22/5/17	W			✓	✓	✓						
3	GW03	22/5/17	W			✓	✓	✓						
4	GW04	23/5/17	W			✓	✓	✓						
5	GW05	23/5/17	W			✓	✓	✓						
6	GW06	23/5/17	W			✓	✓	✓						
7	GW07	23/5/17	W			✓	✓	✓						
8	EW03	22/5/17	W			✓	✓	✓						
9	QA-01	22/5/17	W			✓	✓	✓						
	QA-02	23/5/17	W			✓	✓	✓						→ Forward to Eurofins M&T
10	SW01	23/5/17	W			✓	✓	✓						
11	SW02	23/5/17	W			✓	✓	✓						
				TOTAL										

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.



3-6
12/4
14/6
6-8

Melbourne
3-5 Kingston Town Close
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NATA # 1261
Site # 1254 & 14271

Sydney
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16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261 Site # 18217

ABN – 50 005 085 521 e.mail : EnviroSales@eurofins.com web : www.eurofins.com.au

Sample Receipt Advice

Company name: **GHD Pty Ltd QLD**

Contact name: [redacted]
Project name: ASA
Project ID: 3134249
COC number: Not provided
Turn around time: 5 Day
Date/Time received: May 26, 2017 10:00 AM
Eurofins | mgt reference: **547787**

Sample information

☑ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

☑ Sample Temperature of a random sample selected from the batch as recorded by Eurofins | mgt Sample Receipt : 6.8 degrees Celsius.

☑ 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.

☒ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Contact notes

If you have any questions with respect to these samples please contact:

Mary Makarios on Phone : +61 3 8564 5000 or by e.mail: MaryMakarios@eurofins.com

Results will be delivered electronically via e.mail to [redacted]

eurofins | mgt

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e.mail : EnviroSales@eurofins.com
web : www.eurofins.com.au

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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: ASA
Project ID: 3134249

Order No.:
Report #: 547787
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: May 26, 2017 10:00 AM
Due: Jun 2, 2017
Priority: 5 Day
Contact Name: [redacted]

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Total Alkalinity (as CaCO3)	Total Dissolved Solids	Major Anions	Major Cations	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794										X
Perth Laboratory - NATA Site # 18217										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	QA_02	May 23, 2017		Water	B17-My26533	X	X	X	X	X
Test Counts						1	1	1	1	1

eurofins | mgt

Certificate of Analysis

GHD Pty Ltd QLD
145 Ann Street
Brisbane
QLD 4000

Attention: [redacted]

Report **547787-W**
Project name ASA
Project ID 3134249
Received Date May 26, 2017

Client Sample ID			**QA_02**
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**B17-My26533**
Date Sampled			**May 23, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA)	0.05	ug/L	< 0.05
Perfluoropentanoic acid (PFPeA)	0.01	ug/L	< 0.01
Perfluorohexanoic acid (PFHxA)	0.01	ug/L	< 0.01
Perfluoroheptanoic acid (PFHpA)	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA)	0.01	ug/L	< 0.01
Perfluorononanoic acid (PFNA)	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA)	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnA)	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoA)	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTrDA)	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA)	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	49
13C5-PFPeA (surr.)	1	%	55
13C5-PFHxA (surr.)	1	%	65
13C4-PFHpA (surr.)	1	%	67
13C8-PFOA (surr.)	1	%	63
13C5-PFNA (surr.)	1	%	55
13C6-PFDA (surr.)	1	%	46
13C2-PFUnDA (surr.)	1	%	41
13C2-PFDoDA (surr.)	1	%	44
13C2-PFTeDA (surr.)	1	%	42
Perfluoroalkane sulfonamides (PFASAs)			
Perfluorooctane sulfonamide (FOSA)	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	37
D3-N-MeFOSA (surr.)	1	%	64
D5-N-EtFOSA (surr.)	1	%	64
D7-N-MeFOSE (surr.)	1	%	30

Client Sample ID			QA_02
Sample Matrix			**Water**
Eurofins | mgt Sample No.			**B17-My26533**
Date Sampled			**May 23, 2017**
Test/Reference	LOR	Unit	
Perfluoroalkane sulfonamides (PFASAs)			
D9-N-EtFOSE (surr.)	1	%	32
D5-N-EtFOSAA (surr.)	1	%	59
D3-N-MeFOSAA (surr.)	1	%	53
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)			
Perfluorobutanesulfonic acid (PFBS)	0.01	ug/L	< 0.01
Perfluoropentanesulfonic acid (PFPeS)	0.01	ug/L	< 0.01
Perfluorohexanesulfonic acid (PFHxS)	0.01	ug/L	[N09]0.02
Perfluoroheptanesulfonic acid (PFHpS)	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS)[N11]	0.01	ug/L	[N09]0.01
Perfluorodecanesulfonic acid (PFDS)	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	74
18O2-PFHxS (surr.)	1	%	74
13C8-PFOS (surr.)	1	%	55
n:2 Fluorotelomer sulfonic acids			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	0.01	ug/L	< 0.01
13C2-4:2 FTS (surr.)	1	%	82
13C2-6:2 FTS (surr.)	1	%	87
13C2-8:2 FTS (surr.)	1	%	53
Ammonia (as N)	0.01	mg/L	4.4
Chloride	1	mg/L	4800
Nitrate (as N)	0.02	mg/L	< 0.02
Sulphate (as S)	5	mg/L	220
Total Dissolved Solids	10	mg/L	9000
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	250
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10
Total Alkalinity (as CaCO3)	20	mg/L	250
Alkali Metals			
Calcium	0.5	mg/L	190
Magnesium	0.5	mg/L	370
Potassium	0.5	mg/L	97
Sodium	0.5	mg/L	3000

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results (regarding both quality and NATA accreditation).

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 Polyfluorinated Alkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jun 03, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonamides (PFASAs)	Brisbane	Jun 03, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)	Brisbane	Jun 03, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
n:2 Fluorotelomer sulfonic acids	Brisbane	Jun 03, 2017	14 Day
- Method: LTM-ORG-2100 Per- and Polyfluorinated Alkyl Substances by LC-MS/MS			
Major Cations			
Ammonia (as N)	Melbourne	May 29, 2017	28 Day
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Alkali Metals	Melbourne	May 29, 2017	180 Day
- Method: USEPA 6010 Alkali Metals			
Major Anions			
Chloride	Melbourne	May 29, 2017	28 Day
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Nitrate (as N)	Melbourne	May 29, 2017	7 Day
- Method: APHA 4500-NO3 Nitrate Nitrogen by FIA			
Sulphate (as S)	Melbourne	May 29, 2017	28 Day
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	May 29, 2017	14 Day
- Method: APHA 2320 Alkalinity by Titration			
Total Dissolved Solids	Melbourne	May 29, 2017	7 Day
- Method: LM-LTM-INO-4110 (Total Dissolved Solids @ 178°C - 182°C)			

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NATA # 1261 Site # 20794

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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 18217

Company Name: GHD Pty Ltd QLD
Address: 145 Ann Street
Brisbane
QLD 4000

Project Name: ASA
Project ID: 3134249

Order No.:
Report #: 547787
Phone: 07 3316 3000
Fax: 07 3316 3333

Received: May 26, 2017 10:00 AM
Due: Jun 2, 2017
Priority: 5 Day
Contact Name: [redacted]

Eurofins | mgt Analytical Services Manager : Mary Makarios

Sample Detail						Total Alkalinity (as CaCO3)	Total Dissolved Solids	Major Anions	Major Cations	Per- and Polyfluorinated Alkyl Substances (PFASs)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	
Sydney Laboratory - NATA Site # 18217										
Brisbane Laboratory - NATA Site # 20794										X
Perth Laboratory - NATA Site # 18217										
External Laboratory										
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**					
1	QA_02	May 23, 2017		Water	B17-My26533	X	X	X	X	X
Test Counts						1	1	1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil results are reported on a dry basis, unless otherwise stated.
3. All biota results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. 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 Sample Receipt Advice.

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.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands. In the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
Batch Duplicate	A second piece of analysis from a sample outside of the clients batch of samples but run within the laboratory batch of analysis.
Batch SPIKE	Spike recovery reported on a sample from outside of the clients batch of samples but run within the laboratory batch of analysis.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 50-150%-Phenols & PFASs 20-130%

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
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 (PFUnA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkane sulfonamides (PFASAs)							
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							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	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							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Chloride	mg/L	< 1			1	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Sulphate (as S)	mg/L	< 5			5	Pass	
Total Dissolved Solids	mg/L	< 10			10	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO3)	mg/L	< 10			10	Pass	
Total Alkalinity (as CaCO3)	mg/L	< 20			20	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	114			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	107			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	99			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	98			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	105			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	99			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	101			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	%	106			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	%	106			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	107			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	103			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonamides (PFASAs)							
Perfluorooctane sulfonamide (FOSA)	%	106			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	120			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	121			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	112			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	114			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	102			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	97			50-150	Pass	
LCS - % Recovery							
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	99			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	102			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	92			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	109			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	105			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	97			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	%	97			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	%	87			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	%	71			50-150	Pass	
LCS - % Recovery							
Ammonia (as N)	%	101			70-130	Pass	
Chloride	%	96			70-130	Pass	
Nitrate (as N)	%	104			70-130	Pass	
Sulphate (as S)	%	95			70-130	Pass	
Total Dissolved Solids	%	99			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO3)	%	100			70-130	Pass	
Total Alkalinity (as CaCO3)	%	106			70-130	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	117			70-130	Pass	
Magnesium	%	118			70-130	Pass	
Potassium	%	106			70-130	Pass	
Sodium	%	109			70-130	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)	A17-My28812	NCP	%	114			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	A17-My28812	NCP	%	111			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	A17-My28812	NCP	%	100			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	A17-My28812	NCP	%	101			50-150	Pass	
Perfluorooctanoic acid (PFOA)	A17-My28812	NCP	%	105			50-150	Pass	
Perfluorononanoic acid (PFNA)	A17-My28812	NCP	%	100			50-150	Pass	
Perfluorodecanoic acid (PFDA)	A17-My28812	NCP	%	98			50-150	Pass	
Perfluoroundecanoic acid (PFUnA)	A17-My28812	NCP	%	100			50-150	Pass	
Perfluorododecanoic acid (PFDoA)	A17-My28812	NCP	%	99			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	A17-My28812	NCP	%	105			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	A17-My28812	NCP	%	99			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonamides (PFASAs)				Result 1					
Perfluorooctane sulfonamide (FOSA)	A17-My28812	NCP	%	97			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	A17-My28812	NCP	%	112			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	A17-My28812	NCP	%	112			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	A17-My28812	NCP	%	103			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	A17-My28812	NCP	%	114			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	A17-My28812	NCP	%	102			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	A17-My28812	NCP	%	94			50-150	Pass	
Spike - % Recovery									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	A17-My28812	NCP	%	101			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	A17-My28812	NCP	%	102			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	A17-My28812	NCP	%	99			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	A17-My28812	NCP	%	108			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	A17-My28812	NCP	%	105			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	A17-My28812	NCP	%	90			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	A17-My28812	NCP	%	97			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	A17-My28812	NCP	%	86			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	A17-My28812	NCP	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	A17-My28812	NCP	%	70			50-150	Pass	
Spike - % Recovery									
				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ammonia (as N)	P17-My26938	NCP	%	100			70-130	Pass	
Chloride	M17-My26110	NCP	%	116			70-130	Pass	
Nitrate (as N)	P17-My26938	NCP	%	103			70-130	Pass	
Sulphate (as S)	M17-My28094	NCP	%	109			70-130	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Carbonate Alkalinity (as CaCO3)	M17-My28288	NCP	%	74			70-130	Pass	
Total Alkalinity (as CaCO3)	M17-My28288	NCP	%	79			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	B17-My26533	CP	%	105			70-130	Pass	
Magnesium	B17-My26533	CP	%	98			70-130	Pass	
Potassium	B17-My26533	CP	%	96			70-130	Pass	
Sodium	B17-My26533	CP	%	101			70-130	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)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonamides (PFASAs)				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate									
Perfluoroalkane sulfonic acids & Perfluoroalkane sulfonates (PFSAs)				Result 1	Result 2	RPD			
Perfluorooctanesulfonic acid (PFOS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTS)	A17-My28811	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTS)	A17-My28811	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	P17-My26938	NCP	mg/L	0.27	0.25	7.0	30%	Pass	
Chloride	M17-My27464	NCP	mg/L	1400	1400	1.3	30%	Pass	
Nitrate (as N)	P17-My26938	NCP	mg/L	0.03	0.02	21	30%	Pass	
Sulphate (as S)	M17-My26597	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Total Dissolved Solids	M17-My26511	NCP	mg/L	410	420	2.0	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO3)	M17-My27472	NCP	mg/L	900	950	5.0	30%	Pass	
Carbonate Alkalinity (as CaCO3)	M17-My27472	NCP	mg/L	900	820	9.0	30%	Pass	
Total Alkalinity (as CaCO3)	M17-My27472	NCP	mg/L		1800	2.0	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	B17-My26533	CP	mg/L	190	200	7.0	30%	Pass	
Magnesium	B17-My26533	CP	mg/L	370	400	7.0	30%	Pass	
Potassium	B17-My26533	CP	mg/L	97	110	9.0	30%	Pass	
Sodium	B17-My26533	CP	mg/L	3000	3200	5.0	30%	Pass	

Comments

Sample Integrity

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

Qualifier Codes/Comments

Code	Description
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. 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

Mary Makarios	Analytical Services Manager
Alex Petridis	Senior Analyst-Metal (VIC)
Huong Le	Senior Analyst-Inorganic (VIC)
Jonathon Angell	Senior Analyst-Organic (QLD)

Glenn Jackson

National Operations 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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1709304**	Page	: 1 of 22
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 03 8687 8000	Telephone	: +61-7-3243 7222
Project	: 3134249 ASA - Cairns Airport	Date Samples Received	: 09-May-2017 08:40
Order number	: 313424903	Date Analysis Commenced	: 10-May-2017
C-O-C number	: ----	Issue Date	: 30-May-2017 13:10
Sampler	: [redacted]		
Site	: ----		
Quote number	: EN/005/15		
No. of samples received	: 52		
No. of samples analysed	: 18		

ilac-MRA NATA
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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Greg Vogel	Laboratory Manager	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - ST, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 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.

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

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

- ED006(Exchangeable Cations on Alkaline Soils): Unable to calculate Magnesium/Potassium Ratio for some samples as the required results for Magnesium/Potassium are below LOR.
- ED006(Exchangeable Cations on Alkaline Soils): Unable to calculate Calcium/Magnesium Ratio for sample EB1709304-024 as the required results for Calcium/Magnesium are below LOR.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: ASLP LEACHATE (Matrix: WATER)				Client sample ID	GW01 - 1.5	GW01 - 3.0	GW03 - 1.5	GW04 - 3.0	GW05 - 0.5
				Client sampling date / time	06-May-2017 00:00	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-004	EB1709304-007	EB1709304-018	EB1709304-026	EB1709304-029
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.04**	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**0.08**	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**1.24**	**0.04**	**0.26**	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**0.18**	<0.02	**0.08**	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**8.64**	**0.13**	**5.55**	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.04**	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.11**	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.03**	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.14**	<0.01	**0.02**	<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: ASLP LEACHATE (Matrix: WATER)				Client sample ID	GW01 - 1.5	GW01 - 3.0	GW03 - 1.5	GW04 - 3.0	GW05 - 0.5
				Client sampling date / time	06-May-2017 00:00	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-004	EB1709304-007	EB1709304-018	EB1709304-026	EB1709304-029
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**10.5**	**0.17**	**5.91**	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**9.88**	**0.17**	**5.81**	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L		**10.2**	**0.17**	**5.83**	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**90.3**	**80.7**	**81.9**	**91.6**	**88.6**

Analytical Results

Sub-Matrix: ASLP LEACHATE (Matrix: WATER)				Client sample ID	GW06 - 1.5	GW06 - 4.0	GW07 - 0.5	GW07 - 3.0	----
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	06-May-2017 00:00	06-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		EB1709304-037	EB1709304-041	EB1709304-043	EB1709304-046	--------
					Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.21**	<0.01	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
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: ASLP LEACHATE (Matrix: WATER)				Client sample ID	GW06 - 1.5	GW06 - 4.0	GW07 - 0.5	GW07 - 3.0	----
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	06-May-2017 00:00	06-May-2017 00:00	----
Compound	CAS Number	LOR	Unit		EB1709304-037	EB1709304-041	EB1709304-043	EB1709304-046	--------
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	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		**0.21**	<0.01	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.21**	<0.01	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.21**	<0.01	<0.01	<0.01	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**97.8**	**106**	**108**	**120**	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	GW01 - 1.5	GW01 - 3.0	GW01 - 3.5	GW02 - 1.0	GW02 - 4.0
			Client sampling date / time	06-May-2017 00:00	06-May-2017 00:00	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit	EB1709304-004	EB1709304-007	EB1709304-008	EB1709304-011	EB1709304-015
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.0	9.0	----	7.9	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	25	919	----	32	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	23.9	38.6	----	7.3	29.6
EA150: Particle Sizing								
+75µm	----	1	%	----	----	79	----	----
+150µm	----	1	%	----	----	78	----	----
+300µm	----	1	%	----	----	73	----	----
+425µm	----	1	%	----	----	62	----	----
+600µm	----	1	%	----	----	40	----	----
+1180µm	----	1	%	----	----	10	----	----
+2.36mm	----	1	%	----	----	<1	----	----
+4.75mm	----	1	%	----	----	<1	----	----
+9.5mm	----	1	%	----	----	<1	----	----
+19.0mm	----	1	%	----	----	<1	----	----
+37.5mm	----	1	%	----	----	<1	----	----
+75.0mm	----	1	%	----	----	<1	----	----
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	----	10	----	----
Silt (2-60 µm)	----	1	%	----	----	11	----	----
Sand (0.06-2.00 mm)	----	1	%	----	----	75	----	----
Gravel (>2mm)	----	1	%	----	----	4	----	----
Cobbles (>6cm)	----	1	%	----	----	<1	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	----	2.55	----	----
ED005: Exchange Acidity								
Exchange Acidity	----	0.1	meq/100g	<0.1	----	----	----	----
Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	3.0	----	<0.2	----
Exchangeable Magnesium	----	0.2	meq/100g	----	3.5	----	<0.2	----
Exchangeable Potassium	----	0.2	meq/100g	----	0.5	----	<0.2	----
Exchangeable Sodium	----	0.2	meq/100g	----	1.8	----	<0.2	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW01 - 1.5	GW01 - 3.0	GW01 - 3.5	GW02 - 1.0	GW02 - 4.0
				Client sampling date / time	06-May-2017 00:00	06-May-2017 00:00	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-004	EB1709304-007	EB1709304-008	EB1709304-011	EB1709304-015
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Cation Exchange Capacity	----	0.2	meq/100g		----	8.9	----	<0.2	----
Exchangeable Sodium Percent	----	0.2	%		----	----	----	<0.2	----
Exchangeable Sodium Percent	----	0.2	%		----	20.9	----	----	----
Calcium/Magnesium Ratio	----	0.2	-		----	----	----	1.4	----
Calcium/Magnesium Ratio	----	0.2	-		----	0.9	----	----	----
Magnesium/Potassium Ratio	----	0.2	-		----	6.5	----	----	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		2.9	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		1.1	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.2	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.2	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		4.4	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%		3.9	----	----	----	----
Calcium/Magnesium Ratio	----	0.1	-		2.6	----	----	----	----
Magnesium/Potassium Ratio	----	0.1	-		6.5	----	----	----	----
ED093S: Soluble Major Cations									
Potassium	7440-09-7	10	mg/kg		<10	120	----	<10	300
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		4390	11200	----	7720	5780
Arsenic	7440-38-2	5	mg/kg		7	13	----	8	9
Cadmium	7440-43-9	1	mg/kg		<1	<1	----	<1	<1
Chromium	7440-47-3	2	mg/kg		10	28	----	14	19
Copper	7440-50-8	5	mg/kg		7	9	----	47	6
Iron	7439-89-6	50	mg/kg		6890	23700	----	15900	12200
Manganese	7439-96-5	5	mg/kg		155	408	----	1040	304
Zinc	7440-66-6	5	mg/kg		33	36	----	49	21
EN60: ASLP Leaching Procedure									
Initial pH	----	0.1	pH Unit		7.2	9.3	----	----	----
After HCl pH	----	0.1	pH Unit		1.8	2.0	----	----	----
Extraction Fluid pH	----	0.1	pH Unit		4.9	4.9	----	----	----
Final pH	----	0.1	pH Unit		4.9	5.5	----	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		1.65	1.04	----	0.09	0.53
EP231A: Perfluoroalkyl Sulfonic Acids									

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW01 - 1.5	GW01 - 3.0	GW01 - 3.5	GW02 - 1.0	GW02 - 4.0
				Client sampling date / time	06-May-2017 00:00	06-May-2017 00:00	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-004	EB1709304-007	EB1709304-008	EB1709304-011	EB1709304-015
					Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		**0.0005**	<0.0002	----	**0.0002**	**0.0020**
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		**0.0027**	<0.0002	----	**0.0009**	**0.0043**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0334**	**0.0013**	----	**0.0137**	**0.0235**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		**0.0072**	<0.0002	----	**0.0027**	**0.0017**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.348**	**0.0049**	----	**0.357**	**0.0494**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	----	**0.0016**	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	----	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		**0.0002**	<0.0002	----	**0.0022**	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0070**	**0.0003**	----	**0.0045**	**0.0087**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		**0.0011**	<0.0002	----	**0.0014**	**0.0011**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0071**	<0.0002	----	**0.0032**	**0.0026**
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	----	**0.0004**	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	----	**0.0016**	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	----	**0.0016**	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	----	**0.0019**	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	----	**0.0006**	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<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	----	**0.0018**	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	----	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	----	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW01 - 1.5	GW01 - 3.0	GW01 - 3.5	GW02 - 1.0	GW02 - 4.0
				Client sampling date / time	06-May-2017 00:00	06-May-2017 00:00	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-004	EB1709304-007	EB1709304-008	EB1709304-011	EB1709304-015
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<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
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<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
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
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<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	----	**0.0040**	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	----	**0.0007**	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.407**	**0.0065**	----	**0.400**	**0.0933**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.381**	**0.0062**	----	**0.371**	**0.0729**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.397**	**0.0065**	----	**0.386**	**0.0873**
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		**86.4**	**67.0**	----	**89.6**	**73.4**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**98.6**	**105**	----	**109**	**97.1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	GW03 - 1.5	GW03 - 3.0	GW04 - 1.5	GW04 - 3.0	GW05 - 0.5
			Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit	EB1709304-018	EB1709304-020	EB1709304-024	EB1709304-026	EB1709304-029
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	----	----	8.8	----	4.0
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	----	----	573	----	685
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	23.7	41.4	20.7	26.8	20.2
ED005: Exchange Acidity								
Exchange Acidity	----	0.1	meq/100g	----	----	----	----	4.3
Exchangeable Aluminium	----	0.1	meq/100g	----	----	----	----	3.8
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	----	----	1.4	----	----
Exchangeable Magnesium	----	0.2	meq/100g	----	----	<0.2	----	----
Exchangeable Potassium	----	0.2	meq/100g	----	----	<0.2	----	----
Exchangeable Sodium	----	0.2	meq/100g	----	----	<0.2	----	----
Cation Exchange Capacity	----	0.2	meq/100g	----	----	1.4	----	----
Exchangeable Sodium Percent	----	0.2	%	----	----	<0.2	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	----	1.0
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	----	2.3
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	----	0.3
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	----	0.1
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	----	8.0
Exchangeable Sodium Percent	----	0.1	%	----	----	----	----	2.1
Calcium/Magnesium Ratio	----	0.1	-	----	----	----	----	0.4
Magnesium/Potassium Ratio	----	0.1	-	----	----	----	----	6.9
ED093S: Soluble Major Cations								
Potassium	7440-09-7	10	mg/kg	190	460	40	10	80
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	12400	12000	4980	6100	12400
Arsenic	7440-38-2	5	mg/kg	15	23	<5	12	13
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	27	37	14	20	28
Copper	7440-50-8	5	mg/kg	16	16	6	6	13
Iron	7439-89-6	50	mg/kg	30600	29600	11200	15600	27600
Manganese	7439-96-5	5	mg/kg	599	304	76	27	164

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW03 - 1.5	GW03 - 3.0	GW04 - 1.5	GW04 - 3.0	GW05 - 0.5
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-018	EB1709304-020	EB1709304-024	EB1709304-026	EB1709304-029
					Result	Result	Result	Result	Result
EG005T: Total Metals by ICP-AES - Continued									
Zinc	7440-66-6	5	mg/kg		72	62	15	11	38
EN60: ASLP Leaching Procedure									
Initial pH	----	0.1	pH Unit		8.0	----	----	5.6	4.6
After HCl pH	----	0.1	pH Unit		1.9	----	----	1.8	----
Extraction Fluid pH	----	0.1	pH Unit		4.9	----	----	4.9	4.9
Final pH	----	0.1	pH Unit		5.0	----	----	4.8	4.8
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.42	1.56	0.24	0.54	0.73
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	----	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	----	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0017	0.0008	----	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		0.0007	<0.0002	----	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0488	0.0023	----	<0.0002	0.0012
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<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	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	----	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	0.0005	----	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	----	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<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
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<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
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	----	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	----	<0.0002	<0.0002

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW03 - 1.5	GW03 - 3.0	GW04 - 1.5	GW04 - 3.0	GW05 - 0.5
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-018	EB1709304-020	EB1709304-024	EB1709304-026	EB1709304-029
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<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
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	----	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	----	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<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
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<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
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
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<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
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	----	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		**0.0512**	**0.0036**	----	<0.0002	**0.0012**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0505**	**0.0031**	----	<0.0002	**0.0012**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0505**	**0.0036**	----	<0.0002	**0.0012**
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		**66.3**	**57.1**	**86.4**	**75.7**	**74.4**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW03 - 1.5	GW03 - 3.0	GW04 - 1.5	GW04 - 3.0	GW05 - 0.5
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-018	EB1709304-020	EB1709304-024	EB1709304-026	EB1709304-029
					Result	Result	Result	Result	Result
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**82.6**	**108**	**----**	**97.4**	**101**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW05 - 2.0	GW05 - 2.5	GW06 - 1.5	GW06 - 4.0	GW07 - 0.5
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	06-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-031	EB1709304-032	EB1709304-037	EB1709304-041	EB1709304-043
					Result	Result	Result	Result	Result
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		8.2	----	7.7	7.4	9.2
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		235	----	138	100	819
EA055: Moisture Content									
Moisture Content (dried @ 103°C)	----	1	%		23.7	----	9.0	12.2	12.9
EA150: Particle Sizing									
+75µm	----	1	%		----	49	----	----	63
+150µm	----	1	%		----	41	----	----	55
+300µm	----	1	%		----	28	----	----	50
+425µm	----	1	%		----	25	----	----	48
+600µm	----	1	%		----	21	----	----	46
+1180µm	----	1	%		----	13	----	----	41
+2.36mm	----	1	%		----	5	----	----	34
+4.75mm	----	1	%		----	<1	----	----	26
+9.5mm	----	1	%		----	<1	----	----	7
+19.0mm	----	1	%		----	<1	----	----	<1
+37.5mm	----	1	%		----	<1	----	----	<1
+75.0mm	----	1	%		----	<1	----	----	<1
EA150: Soil Classification based on Particle Size									
Clay (<2 µm)	----	1	%		----	20	----	----	9
Silt (2-60 µm)	----	1	%		----	30	----	----	26
Sand (0.06-2.00 mm)	----	1	%		----	43	----	----	29
Gravel (>2mm)	----	1	%		----	7	----	----	36
Cobbles (>6cm)	----	1	%		----	<1	----	----	<1
EA152: Soil Particle Density									
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3		----	2.88	----	----	2.83
ED006: Exchangeable Cations on Alkaline Soils									
Exchangeable Calcium	----	0.2	meq/100g		<0.2	----	<0.2	0.2	2.3
Exchangeable Magnesium	----	0.2	meq/100g		1.7	----	0.5	<0.2	0.4
Exchangeable Potassium	----	0.2	meq/100g		0.3	----	<0.2	<0.2	<0.2
Exchangeable Sodium	----	0.2	meq/100g		0.6	----	0.4	<0.2	0.3
Cation Exchange Capacity	----	0.2	meq/100g		2.6	----	0.9	0.2	3.0
Exchangeable Sodium Percent	----	0.2	%		24.2	----	45.8	<0.2	10.0
Calcium/Magnesium Ratio	----	0.2	-		----	----	<0.2	2.2	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW05 - 2.0	GW05 - 2.5	GW06 - 1.5	GW06 - 4.0	GW07 - 0.5
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	06-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-031	EB1709304-032	EB1709304-037	EB1709304-041	EB1709304-043
					Result	Result	Result	Result	Result
ED006: Exchangeable Cations on Alkaline Soils - Continued									
Calcium/Magnesium Ratio	----	0.2	-		<0.2	----	----	----	5.3
Magnesium/Potassium Ratio	----	0.2	-		5.9	----	----	----	----
ED093S: Soluble Major Cations									
Potassium	7440-09-7	10	mg/kg		40	----	<10	50	60
EG005T: Total Metals by ICP-AES									
Aluminium	7429-90-5	50	mg/kg		7580	----	8480	1690	8140
Arsenic	7440-38-2	5	mg/kg		8	----	8	<5	7
Cadmium	7440-43-9	1	mg/kg		<1	----	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		20	----	16	5	11
Copper	7440-50-8	5	mg/kg		6	----	29	<5	22
Iron	7439-89-6	50	mg/kg		12400	----	17900	3600	17400
Manganese	7439-96-5	5	mg/kg		79	----	1140	53	823
Zinc	7440-66-6	5	mg/kg		22	----	36	8	35
EN60: ASLP Leaching Procedure									
Initial pH	----	0.1	pH Unit		----	----	8.2	8.5	9.2
After HCl pH	----	0.1	pH Unit		----	----	1.9	1.8	1.8
Extraction Fluid pH	----	0.1	pH Unit		----	----	4.9	4.9	4.9
Final pH	----	0.1	pH Unit		----	----	4.9	4.8	5.0
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		0.70	----	0.54	0.22	1.08
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	----	0.0068	<0.0002	0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	----	<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	<0.001

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW05 - 2.0	GW05 - 2.5	GW06 - 1.5	GW06 - 4.0	GW07 - 0.5
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	06-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-031	EB1709304-032	EB1709304-037	EB1709304-041	EB1709304-043
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<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
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<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
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	----	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg		<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
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<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
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	----	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg		<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
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<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
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
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW05 - 2.0	GW05 - 2.5	GW06 - 1.5	GW06 - 4.0	GW07 - 0.5
				Client sampling date / time	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	06-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1709304-031	EB1709304-032	EB1709304-037	EB1709304-041	EB1709304-043
					Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued									
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<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
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	----	**0.0068**	<0.0002	**0.0002**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	----	**0.0068**	<0.0002	**0.0002**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	----	**0.0068**	<0.0002	**0.0002**
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		**81.9**	----	**82.6**	**93.7**	**66.7**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**100**	----	**82.7**	**104**	**110**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	GW07 - 3.0	QA-01	QA-03	----	----
			Client sampling date / time	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit	EB1709304-046	EB1709304-048	EB1709304-049	--------	--------
				Result	Result	Result	----	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.6	----	----	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	4160	----	----	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	34.3	25.5	10.8	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	3.3	----	----	----	----
Exchangeable Magnesium	----	0.2	meq/100g	3.6	----	----	----	----
Exchangeable Potassium	----	0.2	meq/100g	0.6	----	----	----	----
Exchangeable Sodium	----	0.2	meq/100g	2.3	----	----	----	----
Cation Exchange Capacity	----	0.2	meq/100g	9.8	----	----	----	----
Exchangeable Sodium Percent	----	0.2	%	23.7	----	----	----	----
Calcium/Magnesium Ratio	----	0.2	-	0.9	----	----	----	----
Magnesium/Potassium Ratio	----	0.2	-	6.1	----	----	----	----
ED093S: Soluble Major Cations								
Potassium	7440-09-7	10	mg/kg	380	----	----	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	9920	----	----	----	----
Arsenic	7440-38-2	5	mg/kg	16	----	----	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	----	----	----
Chromium	7440-47-3	2	mg/kg	26	----	----	----	----
Copper	7440-50-8	5	mg/kg	8	----	----	----	----
Iron	7439-89-6	50	mg/kg	20900	----	----	----	----
Manganese	7439-96-5	5	mg/kg	364	----	----	----	----
Zinc	7440-66-6	5	mg/kg	31	----	----	----	----
EN60: ASLP Leaching Procedure								
Initial pH	----	0.1	pH Unit	8.7	----	----	----	----
After HCl pH	----	0.1	pH Unit	2.5	----	----	----	----
Extraction Fluid pH	----	0.1	pH Unit	4.9	----	----	----	----
Final pH	----	0.1	pH Unit	6.0	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	0.24	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW07 - 3.0	QA-01	QA-03	----	----
				Client sampling date / time	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1709304-046	EB1709304-048	EB1709304-049	--------	--------
					Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
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	**0.0004**	----	----
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		**0.0003**	<0.0002	**0.0085**	----	----
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 (PFTrDA)	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	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	GW07 - 3.0	QA-01	QA-03	----	----
				Client sampling date / time	06-May-2017 00:00	05-May-2017 00:00	05-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1709304-046	EB1709304-048	EB1709304-049	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	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		**0.0003**	<0.0002	**0.0089**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0003**	<0.0002	**0.0089**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0003**	<0.0002	**0.0089**	----	----
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		**86.0**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**116**	**113**	**90.6**	----	----

Surrogate Control Limits

Sub-Matrix: **ASLP LEACHATE**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1709304**	Page	: 1 of 18
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	[redacted]	Telephone	: +61-7-3243 7222
Project	: 3134249 ASA - Cairns Airport	Date Samples Received	: 09-May-2017
Order number	: 313424903	Date Analysis Commenced	: 10-May-2017
C-O-C number	: ----	Issue Date	: 30-May-2017
Sampler	: [redacted]		
Site	: ----		
Quote number	: EN/005/15		
No. of samples received	: 52		
No. of samples analysed	: 18		

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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Edwandy Fadjar	Organic Coordinator	Sydney Inorganics, Smithfield, NSW
Greg Vogel	Laboratory Manager	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Stafford Minerals - ST, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 878810)									
EB1709242-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	10.4	10.3	0.00	0% - 20%
EB1709115-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	5.8	5.9	0.00	0% - 20%
EA002 : pH (Soils) (QC Lot: 878815)									
EB1709304-043	GW07 - 0.5	EA002: pH Value	----	0.1	pH Unit	9.2	9.3	0.00	0% - 20%
EA010: Conductivity (QC Lot: 878811)									
EB1709304-037	GW06 - 1.5	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	138	144	4.12	0% - 20%
EB1709115-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	270	276	2.16	0% - 20%
EA055: Moisture Content (QC Lot: 879529)									
EB1709242-002	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	6.3	6.2	2.06	No Limit
EB1709304-020	GW03 - 3.0	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	41.4	38.3	7.86	0% - 20%
EA055: Moisture Content (QC Lot: 894556)									
EM1706120-008	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	3.8	3.7	3.18	No Limit
ES1711089-006	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	12.8	13.6	5.80	0% - 50%
ED005: Exchange Acidity (QC Lot: 883577)									
EB1709204-001	Anonymous	ED005: Exchange Acidity	----	0.1	meq/100g	0.9	0.9	0.00	No Limit
		ED005: Exchangeable Aluminium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
ED005: Exchange Acidity (QC Lot: 883579)									
EB1709304-029	GW05 - 0.5	ED005: Exchange Acidity	----	0.1	meq/100g	4.3	4.3	0.00	0% - 20%
		ED005: Exchangeable Aluminium	----	0.1	meq/100g	3.8	4.1	6.99	0% - 20%
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 883550)									
EB1709304-007	GW01 - 3.0	ED006: Exchangeable Calcium	----	0.1	meq/100g	3.0	3.3	9.69	0% - 50%
		ED006: Exchangeable Magnesium	----	0.1	meq/100g	3.5	3.8	9.54	0% - 50%
		ED006: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.6	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 883550) - continued									
EB1709304-007	GW01 - 3.0	ED006: Exchangeable Sodium	----	0.1	meq/100g	1.8	2.0	9.44	0% - 50%
		ED006: Cation Exchange Capacity	----	0.1	meq/100g	8.9	9.8	9.58	0% - 20%
ED007: Exchangeable Cations (QC Lot: 883578)									
EB1709204-001	Anonymous	ED007: Exchangeable Calcium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
ED008: Exchangeable Cations (QC Lot: 883580)									
EB1709304-029	GW05 - 0.5	ED008: Exchangeable Calcium	----	0.1	meq/100g	1.0	1.1	0.00	0% - 50%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.3	2.4	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.2	0.00	No Limit
ED093S: Soluble Major Cations (QC Lot: 878809)									
EB1709304-029	GW05 - 0.5	ED093S: Potassium	7440-09-7	10	mg/kg	80	70	0.00	No Limit
EB1709115-001	Anonymous	ED093S: Potassium	7440-09-7	10	mg/kg	10	10	0.00	No Limit
EG005T: Total Metals by ICP-AES (QC Lot: 879527)									
EB1709304-020	GW03 - 3.0	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	37	37	0.00	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	23	23	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	16	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	304	299	1.60	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	62	61	2.15	0% - 50%
		EG005T: Aluminium	7429-90-5	50	mg/kg	12000	11900	1.10	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	29600	29600	0.175	0% - 20%
EB1709242-002	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	32	32	0.00	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	19	19	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	750	738	1.58	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	52	51	0.00	0% - 50%
		EG005T: Aluminium	7429-90-5	50	mg/kg	14600	14300	1.92	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	20200	19900	1.63	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 900511)									
EB1709279-007	Anonymous	EP003: Total Organic Carbon	----	0.02	%	0.80	0.83	3.12	0% - 20%
EB1709279-023	Anonymous	EP003: Total Organic Carbon	----	0.02	%	0.65	0.67	2.86	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 900512)									
EB1709304-024	GW04 - 1.5	EP003: Total Organic Carbon	----	0.02	%	0.24	0.26	5.64	0% - 50%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 882100)									
EB1709304-004	GW01 - 1.5	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0005	0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 882100) - continued									
EB1709304-004	GW01 - 1.5	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0027	0.0028	0.00	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0334	0.0353	5.37	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0072	0.0071	0.00	0% - 20%
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.348	0.378	8.24	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EB1709304-041	GW06 - 4.0	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 882100)									
EB1709304-004	GW01 - 1.5	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0070	0.0064	9.72	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0011	0.0011	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0071	0.0074	4.27	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EB1709304-041	GW06 - 4.0	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 882100)									
EB1709304-004	GW01 - 1.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 882100) - continued									
EB1709304-004	GW01 - 1.5	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EB1709304-041	GW06 - 4.0	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 882100)									
EB1709304-004	GW01 - 1.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EB1709304-041	GW06 - 4.0	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 898040)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 898040) - continued									
EB1709304-004	GW01 - 1.5	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	8.64	9.00	4.07	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	0.08	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.24	1.28	3.41	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.18	0.19	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES1709760-006	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	6.63	7.60	13.7	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.58	0.66	11.8	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.10	17.8	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 900072)									
EB1709304-037	GW06 - 1.5	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.21	0.23	5.45	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES1709760-018	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.68	2.63	1.96	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.20	0.23	13.7	0% - 50%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.03	0.03	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 898040)									
EB1709304-004	GW01 - 1.5	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.14	0.15	6.99	0% - 50%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.11	0.11	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
ES1709760-006	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.05	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.04	0.05	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.29	0.33	12.6	0% - 50%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 898040) - continued									
ES1709760-006	Anonymous	EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 900072)									
EB1709304-037	GW06 - 1.5	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
ES1709760-018	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.03	0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.64	0.69	7.05	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 898040)									
EB1709304-004	GW01 - 1.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 898040) - continued									
EB1709304-004	GW01 - 1.5	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1709760-006	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 900072)									
EB1709304-037	GW06 - 1.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1709760-018	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 900072) - continued									
ES1709760-018	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 898040)									
EB1709304-004	GW01 - 1.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1709760-006	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 900072)									
EB1709304-037	GW06 - 1.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES1709760-018	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 898040)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231P: PFAS Sums (QC Lot: 898040) - continued									
EB1709304-004	GW01 - 1.5	EP231X: Sum of PFAS	----	0.01	µg/L	10.5	10.9	3.83	0% - 20%
ES1709760-006	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	7.74	8.87	13.6	0% - 20%
EP231P: PFAS Sums (QC Lot: 900072)									
EB1709304-037	GW06 - 1.5	EP231X: Sum of PFAS	----	0.01	µg/L	0.21	0.23	9.09	0% - 20%
ES1709760-018	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	3.59	3.61	0.556	0% - 20%

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002 : pH (Soils) (QCLot: 878810)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	98	102
				----	7 pH Unit	100	98	102
EA002 : pH (Soils) (QCLot: 878815)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	99.5	98	102
				----	7 pH Unit	99.8	98	102
EA010: Conductivity (QCLot: 878811)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.4	97	103
ED005: Exchange Acidity (QCLot: 883577)								
ED005: Exchange Acidity	----	0.1	meq/100g	<0.1	----	----	----	----
ED005: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED005: Exchange Acidity (QCLot: 883579)								
ED005: Exchange Acidity	----	0.1	meq/100g	<0.1	----	----	----	----
ED005: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED006: Exchangeable Cations on Alkaline Soils (QCLot: 883550)								
ED006: Exchangeable Calcium	----	0.1	meq/100g	<0.1	4.7161 meq/100g	122	70	130
ED006: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.7407 meq/100g	125	70	130
ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.2248 meq/100g	81.4	70	130
ED006: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.5971 meq/100g	105	70	130
ED006: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	7.2788 meq/100g	120	70	130
ED007: Exchangeable Cations (QCLot: 883578)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	15.5 meq/100g	98.5	79	113
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	9.87 meq/100g	99.3	85	115
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.561 meq/100g	97.4	70	122
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	11.2 meq/100g	90.9	76	112
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	37.131 meq/100g	96.5	82	112
ED008: Exchangeable Cations (QCLot: 883580)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	10.925 meq/100g	101	91	109
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	5.9518 meq/100g	102	89	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.4769 meq/100g	94.0	79	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.8718 meq/100g	81.0	75	118
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	18.2255 meq/100g	101	88	110
ED093S: Soluble Major Cations (QCLot: 878809)								
ED093S: Potassium	7440-09-7	10	mg/kg	<10	500 mg/kg	98.1	80	120

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EG005T: Total Metals by ICP-AES (QCLot: 879527)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	118.9 mg/kg	94.8	84	123
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.87125 mg/kg	106	88	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	22.7 mg/kg	85.5	83	125
EG005T: Copper	7440-50-8	5	mg/kg	<5	55 mg/kg	99.9	86	122
EG005T: Iron	7439-89-6	50	mg/kg	<50	34900 mg/kg	89.1	70	120
EG005T: Manganese	7439-96-5	5	mg/kg	<5	604.6 mg/kg	93.7	84	113
EG005T: Zinc	7440-66-6	5	mg/kg	<5	182.3 mg/kg	100	87	127
EN60: ASLP Leaching Procedure (QCLot: 892174)								
EN60a: Final pH	----	0.1	pH Unit	1.0	----	----	----	----
EN60: ASLP Leaching Procedure (QCLot: 895019)								
EN60a: Final pH	----	0.1	pH Unit	1.0	----	----	----	----
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 900511)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	100 %	101	70	130
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 900512)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	100 %	110	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 882100)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.2	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.7	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.3	52	126
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.6	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.2	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.6	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 882100)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	83.1	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.7	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	83.8	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.0	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.2	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.8	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.7	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.2	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.7	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 882100)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.1	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.5	65	126

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 882100) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.5	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.9	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	102	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.4	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 882100)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	106	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	113	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	100	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	106	60	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 898040)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	72.4	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	87.2	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	87.6	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	90.2	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	84.2	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	122	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 900072)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	82.4	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	96.8	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	106	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	90.4	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	80.4	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	87.2	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 898040)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	91.1	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	87.8	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	77.6	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	81.2	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	93.4	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	85.0	70	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 898040) - continued								
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	92.2	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	107	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	79.0	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	72.2	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	102	70	124
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 900072)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	89.3	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	84.8	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	93.6	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	105	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	107	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	88.2	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	89.2	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	96.2	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	115	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	92.0	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	99.0	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 898040)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	77.4	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	97.7	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	105	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	105	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	90.6	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	121	70	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 900072)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	80.0	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	119	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	103	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	101	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	92.8	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	90.4	70	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 900072) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	91.6	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 898040)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	84.0	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	73.8	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	75.4	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	78.8	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 900072)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	81.0	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	83.8	70	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	97.8	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	101	70	130

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**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 879527)							
EB1709242-003	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	97.2	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	102	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	107	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	108	70	130
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	110	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 882100)							
EB1709304-004	GW01 - 1.5	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	87.6	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	60.8	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	59.6	50	130

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 882100)							
EB1709304-004	GW01 - 1.5	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	99.0	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	59.6	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	65.2	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	# Not Determined	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	65.2	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	76.0	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	60.4	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	68.4	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	74.0	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	86.8	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 882100)							
EB1709304-004	GW01 - 1.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	84.8	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	64.7	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	59.1	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	65.2	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	67.9	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	94.4	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	106	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 882100)							
EB1709304-004	GW01 - 1.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	77.2	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	119	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	110	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	110	50	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 898040)							
EB1709304-004	GW01 - 1.5	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	68.0	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	103	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	103	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 898040) - continued							
EB1709304-004	GW01 - 1.5	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	106	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	108	50	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 900072)							
EB1709304-037	GW06 - 1.5	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	84.2	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	82.2	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	117	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	95.6	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	84.4	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	95.6	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 898040)							
EB1709304-004	GW01 - 1.5	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	115	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	98.8	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	82.8	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	104	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	109	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	83.6	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	97.6	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	98.6	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	88.4	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	61.0	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	70.9	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 900072)							
EB1709304-037	GW06 - 1.5	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	95.5	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	113	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	84.0	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	89.8	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	112	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	89.4	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	89.8	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	113	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	66.2	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	76.8	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	70.9	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 898040)							
EB1709304-004	GW01 - 1.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	97.0	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 898040) - continued							
EB1709304-004	GW01 - 1.5	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	100	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	124	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	116	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	113	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	88.2	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	97.6	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 900072)							
EB1709304-037	GW06 - 1.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	82.0	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	74.4	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	96.9	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	67.1	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	101	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	73.2	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	65.2	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 898040)							
EB1709304-004	GW01 - 1.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	111	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	100	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	114	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	80.4	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 900072)							
EB1709304-037	GW06 - 1.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	82.6	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	92.2	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	78.6	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	74.8	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1709304**	Page	: 1 of 12
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Telephone	: +61-7-3243 7222
Project	: 3134249 ASA - Cairns Airport	Date Samples Received	: 09-May-2017
Site	: ----	Issue Date	: 30-May-2017
Sampler	: [redacted]	No. of samples received	: 52
Order number	: 313424903	No. of samples analysed	: 18

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							
EG005T: Total Metals by ICP-AES	EB1709242--003	Anonymous	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1709304--004	GW01 - 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	EB1709304--004	GW01 - 1.5	**Perfluoroheptane sulfonic acid (PFHpS)**	375-92-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231A: Perfluoroalkyl Sulfonic Acids	EB1709304--004	GW01 - 1.5	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1709304--004	GW01 - 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	EB1709304--004	GW01 - 1.5	**Perfluorooctanoic acid (PFOA)**	335-67-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1709304--004	GW01 - 1.5	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	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 / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Snap Lock Bag (EA002)							
GW04 - 1.5	**05-May-2017**	**11-May-2017**	12-May-2017	✓	**11-May-2017**	11-May-2017	✓
Soil Glass Jar - Unpreserved (EA002)							
GW02 - 1.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**11-May-2017**	12-May-2017	✓	**11-May-2017**	11-May-2017	✓
Soil Glass Jar - Unpreserved (EA002)							
GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**11-May-2017**	13-May-2017	✓	**11-May-2017**	11-May-2017	✓
EA010: Conductivity							
Snap Lock Bag (EA010)							
GW04 - 1.5	**05-May-2017**	**11-May-2017**	12-May-2017	✓	**11-May-2017**	08-Jun-2017	✓
Soil Glass Jar - Unpreserved (EA010)							
GW02 - 1.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**11-May-2017**	12-May-2017	✓	**11-May-2017**	08-Jun-2017	✓
Soil Glass Jar - Unpreserved (EA010)							
GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**11-May-2017**	13-May-2017	✓	**11-May-2017**	08-Jun-2017	✓
EA055: Moisture Content							
HDPE Soil Jar (EA055-103)							
QA-01, QA-03	**05-May-2017**	**----**	----	----	**18-May-2017**	19-May-2017	✓
Snap Lock Bag (EA055-103)							
GW04 - 1.5	**05-May-2017**	**----**	----	----	**10-May-2017**	19-May-2017	✓
Soil Glass Jar - Unpreserved (EA055-103)							
GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**----**	----	----	**10-May-2017**	19-May-2017	✓
Soil Glass Jar - Unpreserved (EA055-103)							
GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**----**	----	----	**10-May-2017**	20-May-2017	✓
EA150: Particle Sizing							
Snap Lock Bag (EA150H)							
GW05 - 2.5	**05-May-2017**	**----**	----	----	**23-May-2017**	01-Nov-2017	✓
Snap Lock Bag (EA150H)							
GW01 - 3.5, GW07 - 0.5	**06-May-2017**	**----**	----	----	**23-May-2017**	02-Nov-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA150: Soil Classification based on Particle Size							
Snap Lock Bag (EA150H) GW05 - 2.5	**05-May-2017**	**----**	----	----	**23-May-2017**	01-Nov-2017	✓
Snap Lock Bag (EA150H) GW01 - 3.5, GW07 - 0.5	**06-May-2017**	**----**	----	----	**23-May-2017**	02-Nov-2017	✓
EA152: Soil Particle Density							
Snap Lock Bag (EA152) GW05 - 2.5	**05-May-2017**	**----**	----	----	**23-May-2017**	01-Nov-2017	✓
Snap Lock Bag (EA152) GW01 - 3.5, GW07 - 0.5	**06-May-2017**	**----**	----	----	**23-May-2017**	02-Nov-2017	✓
ED005: Exchange Acidity							
Soil Glass Jar - Unpreserved (ED005) GW05 - 0.5	**05-May-2017**	**22-May-2017**	02-Jun-2017	✓	**22-May-2017**	02-Jun-2017	✓
Soil Glass Jar - Unpreserved (ED005) GW01 - 1.5	**06-May-2017**	**15-May-2017**	03-Jun-2017	✓	**15-May-2017**	03-Jun-2017	✓
ED006: Exchangeable Cations on Alkaline Soils							
Pulp Bag (ED006) GW04 - 1.5	**05-May-2017**	**22-May-2017**	02-Jun-2017	✓	**22-May-2017**	02-Jun-2017	✓
Soil Glass Jar - Unpreserved (ED006) GW02 - 1.0, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**22-May-2017**	02-Jun-2017	✓	**22-May-2017**	02-Jun-2017	✓
Soil Glass Jar - Unpreserved (ED006) GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**22-May-2017**	03-Jun-2017	✓	**22-May-2017**	03-Jun-2017	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007) GW01 - 1.5	**06-May-2017**	**15-May-2017**	03-Jun-2017	✓	**15-May-2017**	03-Jun-2017	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008) GW05 - 0.5	**05-May-2017**	**22-May-2017**	02-Jun-2017	✓	**22-May-2017**	02-Jun-2017	✓
ED093S: Soluble Major Cations							
Snap Lock Bag (ED093S) GW04 - 1.5	**05-May-2017**	**11-May-2017**	01-Nov-2017	✓	**12-May-2017**	01-Nov-2017	✓
Soil Glass Jar - Unpreserved (ED093S) GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**11-May-2017**	01-Nov-2017	✓	**12-May-2017**	01-Nov-2017	✓
Soil Glass Jar - Unpreserved (ED093S) GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**11-May-2017**	02-Nov-2017	✓	**12-May-2017**	02-Nov-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG005T: Total Metals by ICP-AES							
Snap Lock Bag (EG005T)							
GW04 - 1.5	**05-May-2017**	**10-May-2017**	01-Nov-2017	✓	**11-May-2017**	01-Nov-2017	✓
Soil Glass Jar - Unpreserved (EG005T)							
GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**10-May-2017**	01-Nov-2017	✓	**11-May-2017**	01-Nov-2017	✓
Soil Glass Jar - Unpreserved (EG005T)							
GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**10-May-2017**	02-Nov-2017	✓	**11-May-2017**	02-Nov-2017	✓
EN60: ASLP Leaching Procedure							
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN60a)							
GW03 - 1.5, GW04 - 3.0, GW05 - 0.5	**05-May-2017**	**17-May-2017**	19-May-2017	✓	**----**	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN60a)							
GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**18-May-2017**	19-May-2017	✓	**----**	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN60a)							
GW01 - 1.5, GW01 - 3.0	**06-May-2017**	**17-May-2017**	20-May-2017	✓	**----**	----	----
Non-Volatile Leach: 14 day HT(e.g. SV organics) (EN60a)							
GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**18-May-2017**	20-May-2017	✓	**----**	----	----
EP003: Total Organic Carbon (TOC) in Soil							
Pulp Bag (EP003)							
GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 1.5, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0	**05-May-2017**	**22-May-2017**	02-Jun-2017	✓	**22-May-2017**	02-Jun-2017	✓
Pulp Bag (EP003)							
GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**22-May-2017**	03-Jun-2017	✓	**22-May-2017**	03-Jun-2017	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0, QA-01, QA-03	**05-May-2017**	**15-May-2017**	01-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓
HDPE Soil Jar (EP231X)							
GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**15-May-2017**	02-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0, QA-01, QA-03	**05-May-2017**	**15-May-2017**	01-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓
HDPE Soil Jar (EP231X) GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**15-May-2017**	02-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0, QA-01, QA-03	**05-May-2017**	**15-May-2017**	01-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓
HDPE Soil Jar (EP231X) GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**15-May-2017**	02-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0, QA-01, QA-03	**05-May-2017**	**15-May-2017**	01-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓
HDPE Soil Jar (EP231X) GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**15-May-2017**	02-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) GW02 - 1.0, GW02 - 4.0, GW03 - 1.5, GW03 - 3.0, GW04 - 3.0, GW05 - 0.5, GW05 - 2.0, GW06 - 1.5, GW06 - 4.0, QA-01, QA-03	**05-May-2017**	**15-May-2017**	01-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓
HDPE Soil Jar (EP231X) GW01 - 1.5, GW01 - 3.0, GW07 - 0.5, GW07 - 3.0	**06-May-2017**	**15-May-2017**	02-Nov-2017	✓	**15-May-2017**	24-Jun-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) GW01 - 1.5, GW01 - 3.0, GW03 - 1.5, GW04 - 3.0, GW05 - 0.5	**17-May-2017**	**----**	----	----	**19-May-2017**	13-Nov-2017	✓
HDPE (no PTFE) (EP231X) GW06 - 1.5, GW06 - 4.0, GW07 - 0.5, GW07 - 3.0	**18-May-2017**	**----**	----	----	**22-May-2017**	14-Nov-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) GW01 - 1.5, GW01 - 3.0, GW03 - 1.5, GW04 - 3.0, GW05 - 0.5	**17-May-2017**	**----**	----	----	**19-May-2017**	13-Nov-2017	✓
HDPE (no PTFE) (EP231X) GW06 - 1.5, GW06 - 4.0, GW07 - 0.5, GW07 - 3.0	**18-May-2017**	**----**	----	----	**22-May-2017**	14-Nov-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) GW01 - 1.5, GW01 - 3.0, GW03 - 1.5, GW04 - 3.0, GW05 - 0.5	**17-May-2017**	**----**	----	----	**19-May-2017**	13-Nov-2017	✓
HDPE (no PTFE) (EP231X) GW06 - 1.5, GW06 - 4.0, GW07 - 0.5, GW07 - 3.0	**18-May-2017**	**----**	----	----	**22-May-2017**	14-Nov-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) GW01 - 1.5, GW01 - 3.0, GW03 - 1.5, GW04 - 3.0, GW05 - 0.5	**17-May-2017**	**----**	----	----	**19-May-2017**	13-Nov-2017	✓
HDPE (no PTFE) (EP231X) GW06 - 1.5, GW06 - 4.0, GW07 - 0.5, GW07 - 3.0	**18-May-2017**	**----**	----	----	**22-May-2017**	14-Nov-2017	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) GW01 - 1.5, GW01 - 3.0, GW03 - 1.5, GW04 - 3.0, GW05 - 0.5	**17-May-2017**	**----**	----	----	**19-May-2017**	13-Nov-2017	✓
HDPE (no PTFE) (EP231X) GW06 - 1.5, GW06 - 4.0, GW07 - 0.5, GW07 - 3.0	**18-May-2017**	**----**	----	----	**22-May-2017**	14-Nov-2017	✓

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)							
Cations - soluble by ICP-AES	ED093S	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchange Acidity by 1M Potassium Chloride	ED005	2	4	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	**100.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055-103	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Cations - soluble by ICP-AES	ED093S	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	22	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
ASLP for Non & Semivolatile Analytes	EN60a	2	10	**20.00**	**9.09**	✓	NEPM 2013 B3 & ALS QC Standard
Cations - soluble by ICP-AES	ED093S	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchange Acidity by 1M Potassium Chloride	ED005	2	4	**50.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	**100.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	28	**7.14**	**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
Total Metals by ICP-AES	EG005T	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	28	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 104)
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3 - 2003
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1-2006 : Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Exchange Acidity by 1M Potassium Chloride	ED005	SOIL	In house: referenced to Rayment and Lyons, (2011), method 15G1. This method is unsuitable for near neutral and alkaline soils. NATA accreditation does not cover performance of this service.
Exchangeable Cations on Alkaline Soils	ED006	SOIL	In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons (2011) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Higginson (2011) Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Cations - soluble by ICP-AES	ED093S	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.
Sodium Peroxide fusion - ICPAES finish	ME-ICP81x	SOIL	Analysis conducted by ALS Minerals.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method (Alkaline Soils)	ED006PR	SOIL	In house: Referenced to Rayment and Lyons 2011 method 15C1.
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
ASLP for Non & Semivolatile Analytes	EN60a	SOIL	In house QWI-EN/60 referenced to AS4439.3 Preparation of Leachates
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Sample Extraction for PFAS	EP231-PR	SOIL	In house
Dry and Pulverise (up to 100g)	GEO30	SOIL	#

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1709304**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: [redacted]	E-mail	: ALSEnviro.Brisbane@alsglobal.com
Telephone	: [redacted]	Telephone	: +61-7-3243 7222
Facsimile	: [redacted]	Facsimile	: +61-7-3243 7218
Project	: 3134249 ASA - Cairns Airport	Page	: 1 of 4
Order number	: 313424903	Quote number	: ES2015GHDSER0820 (EN/005/15)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: [redacted]		

Dates

Date Samples Received	: 09-May-2017 08:40	Issue Date	: 09-May-2017
Client Requested Due Date	: 23-May-2017	Scheduled Reporting Date	: **23-May-2017**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 4.6°C, 0.1°C, 5°C, 0.4°C - Ice present
Receipt Detail	: MEDIUM ESKIES	No. of samples received / analysed	: 52 / 18

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
- **Samples "QA-02" and "QA-04" have been forwarded to Eurofins as per the COC.**
- **Please note PFAS analysis has not been assigned to sample #24 as no PFAS containers were provided. PSD % Clay has not been assigned as only one snap lock bag with ~600 grams of sample was provided.**
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- **An extra sample was received labelled as "GW05 - 1.0 " (ALS # 52) and has been placed on hold. If testing is required on this sample, please contact ALS Client Services at ALSEnviro.Brisbane@alsglobal.com**
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**

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	Client sampling date / time	Client sample ID	(On Hold) SOIL No analysis requested	SOIL - EA010 (solids): Electrical Conductivity (1:5)	SOIL - EA055-103 Moisture Content	SOIL - ED093S Cations - Soluble	SOIL - EN60a ASLP Leachate Procedure	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - EP231X PFAS - Full Suite (28 analytes)
EB1709304-001	06-May-2017 00:00	GW01 - 0.2	✓						
EB1709304-002	06-May-2017 00:00	GW01 - 0.5	✓						
EB1709304-003	06-May-2017 00:00	GW01 - 1.0	✓						
EB1709304-004	06-May-2017 00:00	GW01 - 1.5		✓	✓	✓	✓	✓	✓
EB1709304-005	06-May-2017 00:00	GW01 - 2.0	✓						
EB1709304-006	06-May-2017 00:00	GW01 - 2.5	✓						
EB1709304-007	06-May-2017 00:00	GW01 - 3.0		✓	✓	✓	✓	✓	✓
EB1709304-009	06-May-2017 00:00	GW01 - 4.0	✓						
EB1709304-010	05-May-2017 00:00	GW02 - 0.5	✓						
EB1709304-011	05-May-2017 00:00	GW02 - 1.0		✓	✓	✓		✓	
EB1709304-012	05-May-2017 00:00	GW02 - 1.5	✓						
EB1709304-013	05-May-2017 00:00	GW02 - 2.0	✓						
EB1709304-014	05-May-2017 00:00	GW02 - 3.0	✓						
EB1709304-015	05-May-2017 00:00	GW02 - 4.0			✓	✓		✓	
EB1709304-016	05-May-2017 00:00	GW03 - 0.5	✓						
EB1709304-017	05-May-2017 00:00	GW03 - 1.0	✓						
EB1709304-018	05-May-2017 00:00	GW03 - 1.5			✓	✓	✓	✓	✓
EB1709304-019	05-May-2017 00:00	GW03 - 2.0	✓						
EB1709304-020	05-May-2017 00:00	GW03 - 3.0			✓	✓		✓	
EB1709304-021	05-May-2017 00:00	GW03 - 4.0	✓						
EB1709304-022	05-May-2017 00:00	GW04 - 0.5	✓						
EB1709304-023	05-May-2017 00:00	GW04 - 1.0	✓						
EB1709304-024	05-May-2017 00:00	GW04 - 1.5			✓	✓			
EB1709304-025	05-May-2017 00:00	GW04 - 2.0	✓						
EB1709304-026	05-May-2017 00:00	GW04 - 3.0			✓	✓	✓	✓	✓
EB1709304-027	05-May-2017 00:00	GW04 - 4.0	✓						
EB1709304-028	05-May-2017 00:00	GW05 - 0.2	✓						
EB1709304-029	05-May-2017 00:00	GW05 - 0.5		✓	✓	✓	✓	✓	✓
EB1709304-030	05-May-2017 00:00	GW05 - 1.5	✓						
EB1709304-031	05-May-2017 00:00	GW05 - 2.0		✓	✓	✓		✓	
EB1709304-033	05-May-2017 00:00	GW05 - 3.5	✓						
EB1709304-034	05-May-2017 00:00	GW06 - 0.2	✓						
EB1709304-035	05-May-2017 00:00	GW06 - 0.5	✓						
EB1709304-036	05-May-2017 00:00	GW06 - 1.0	✓						
EB1709304-037	05-May-2017 00:00	GW06 - 1.5		✓	✓	✓	✓	✓	✓

			(On Hold) SOIL No analysis requested	SOIL - EA010 (solids): Electrical Conductivity (1:5)	SOIL - EA055-103 Moisture Content	SOIL - ED093S Cations - Soluble	SOIL - EN60a ASLP Leachate Procedure	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - EP231X PFAS - Full Suite (28 analytes)
EB1709304-038	05-May-2017 00:00	GW06 - 2.0	✓						
EB1709304-039	05-May-2017 00:00	GW06 - 2.5	✓						
EB1709304-040	05-May-2017 00:00	GW06 - 3.0	✓						
EB1709304-041	05-May-2017 00:00	GW06 - 4.0		✓	✓	✓	✓	✓	✓
EB1709304-042	06-May-2017 00:00	GW07 - 0.2	✓						
EB1709304-043	06-May-2017 00:00	GW07 - 0.5		✓	✓	✓	✓	✓	✓
EB1709304-044	06-May-2017 00:00	GW07 - 1.0	✓						
EB1709304-045	06-May-2017 00:00	GW07 - 2.0	✓						
EB1709304-046	06-May-2017 00:00	GW07 - 3.0		✓	✓	✓	✓	✓	✓
EB1709304-047	06-May-2017 00:00	GW07 - 4.0	✓						
EB1709304-048	05-May-2017 00:00	QA-01			✓			✓	
EB1709304-049	05-May-2017 00:00	QA-03			✓			✓	
EB1709304-050	06-May-2017 00:00	QA-05	✓						
EB1709304-051	06-May-2017 00:00	QA-06	✓						
EB1709304-052	05-May-2017 00:00	GW05 - 1.0	✓						

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA002 pH (1:5)	SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EP003 Total Organic Carbon (TOC) in Soil	SOIL - ME-ICP81 (Subcontracted) Silica by Peroxide fusion - ICPAES finish
EB1709304-004	06-May-2017 00:00	GW01 - 1.5	✓		✓	✓	✓
EB1709304-007	06-May-2017 00:00	GW01 - 3.0	✓		✓	✓	✓
EB1709304-008	06-May-2017 00:00	GW01 - 3.5		✓			
EB1709304-011	05-May-2017 00:00	GW02 - 1.0	✓		✓	✓	✓
EB1709304-015	05-May-2017 00:00	GW02 - 4.0			✓	✓	✓
EB1709304-018	05-May-2017 00:00	GW03 - 1.5			✓	✓	✓
EB1709304-020	05-May-2017 00:00	GW03 - 3.0			✓	✓	✓
EB1709304-024	05-May-2017 00:00	GW04 - 1.5			✓	✓	✓
EB1709304-026	05-May-2017 00:00	GW04 - 3.0			✓	✓	✓
EB1709304-029	05-May-2017 00:00	GW05 - 0.5	✓		✓	✓	✓
EB1709304-031	05-May-2017 00:00	GW05 - 2.0	✓		✓	✓	✓
EB1709304-032	05-May-2017 00:00	GW05 - 2.5		✓			
EB1709304-037	05-May-2017 00:00	GW06 - 1.5	✓		✓	✓	✓
EB1709304-041	05-May-2017 00:00	GW06 - 4.0	✓		✓	✓	✓
EB1709304-043	06-May-2017 00:00	GW07 - 0.5	✓	✓	✓	✓	✓

			SOIL - EA002 pH (1:5)	SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EP003 Total Organic Carbon (TOC) in Soil	SOIL - ME-ICP81 (Subcontracted) Silica by Peroxide fusion - ICPAES finish
EB1709304-046	06-May-2017 00:00	GW07 - 3.0	✓		✓	✓	✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)

- A4 - AU [redacted] [redacted] [redacted]
- *AU Certificate of Analysis - NATA (COA) Email [redacted]
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email [redacted]
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email [redacted]
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email [redacted]
- A4 - AU Tax Invoice (INV) Email [redacted]
- Attachment - Report (SUBCO) Email [redacted]
- Chain of Custody (CoC) (COC) Email [redacted]
- EDI Format - ENMRG (ENMRG) Email [redacted]
- EDI Format - ESDAT (ESDAT) Email [redacted]
- EDI Format - XTab (XTAB) Email [redacted]
- Electronic SRN for ESdat (ESRN_ESDAT) Email [redacted]

[redacted]

- *AU Certificate of Analysis - NATA (COA) Email [redacted]
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) Email [redacted]
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) Email [redacted]
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) Email [redacted]
- A4 - AU Tax Invoice (INV) Email [redacted]
- Attachment - Report (SUBCO) Email [redacted]
- Chain of Custody (CoC) (COC) Email [redacted]
- [redacted] Format - ENMRG (ENMRG) Email [redacted]
- EDI Format - ESDAT (ESDAT) Email [redacted]
- EDI Format - XTab (XTAB) Email [redacted]
- Electronic SRN for ESdat (ESRN_ESDAT) Email [redacted]

ALS

CHAIN OF CUSTODY

ALS Laboratory: *please tick →*

☐ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8162 5130 E: adelaide@alsglobal.com
☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
☐GLADSTONE 46 Callemondah Drive Gladstone QLD 4680 Ph: 07 4978 7944 E: ALSEnviro.Gladstone@alsglobal.com
☐MACKAY Unit 2/20 Caterpillar Drive Paget QLD 4740 Ph: 07 4952 5795 E: ALSEnviro.Mackay@alsglobal.com
☐MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
☐MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
☐NEWCASTLE 5/585 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com
☐NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com
☐PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com
☐WOL...
Ph: 02 ...

CLIENT: GHD Pty Ltd

OFFICE: 145 Ann st, Brisbane

PROJECT: ASA - Cairns Airport   PROJECT NO.: 3134249

ORDER NUMBER: 313424903   PURCHASE ORDER NO.:

PROJECT MANAGER: [redacted]   CONTACT PH:

SAMPLER: [redacted]   SAMPLER MOBILE: [redacted]

COC Emailed to ALS? (YES / NO)   EDD FORMAT (or default): Esdat

Email Reports to (will default to PM if no other addresses are listed): [redacted]

Email Invoice to (will default to PM if no other addresses are listed):

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

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 NO.:

COUNTRY OF ORIGIN:

COC SEQUENCE NUMBER (Circle)

COC: (1) 2 3 4 5 6 7

OF: 1 2 3 4 (5) 6 7

FOR LABOR...

Custody Seal In...   N/A

Free ice / frozen ... receipt?   N/A

Random Sampl...

Other comment...

RELINQUISHED BY: [redacted]

DATE/TIME: 8/5/17 8:00 AM

RECEIVED BY: Cameron

DATE/TIME: 9/5/17 8:40

RELINQUISHED B...

DATE/TIME:

Environmental Division
Brisbane
Work Order Reference
EB1709304

Telephone : + 61-7-3243 7222

ALS USE ONLY LAB ID	SAMPLE DETAILS MATRIX: Solid(S) Water(W) SAMPLE ID	DATE / TIME	MATRIX	CONTAINER INFORMATION TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	PFAS Extended Suite	~~Major cation/Anions~~ ASLP PFAS	Total organic Carbon (TOC)	~~Total ...~~ CEC (pH dependent)	~~...~~ Metals *	PSD + % clay	Potassium	Silica	Additional Information Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	GW01-0.2	6/5/17	S											* Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
2	GW01-0.5	|	|											
3	GW01-1.0	|	|											
4	GW01-1.5	|	|			✓	✓	✓	✓	✓		✓	✓	
5	GW01-2.0	|	|											
6	GW01-2.5	|	|											
7	GW01-3.0	|	|			✓	✓	✓	✓	✓		✓	✓	
8	GW01-3.5	|	|								✓			
9	GW01-4.0	|	|											
10	GW02-0.5	5/5/17	|											
11	GW02-1.0	|	|			✓		✓	✓	✓		✓	✓	
12	GW02-1.5	|	|											
				TOTAL										

SCANNED

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; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ADELAIDE 3/1 Burma Road Pooraka SA 5095 Ph: 08 3102 5130 E: adelaide@alsglobal.com
☐BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
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☐SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
☐TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com
☐WOLLONGONG 1/19-21 Ralph Black Drive Nth Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT:	
OFFICE:	
PROJECT:	PROJECT NO.:
ORDER NUMBER:	PURCHASE ORDER NO.:
PROJECT MANAGER:	CONTACT PH:
SAMPLER:	SAMPLER MOBILE:
COC Emailed to ALS? (YES / NO)	EDD FORMAT (or default):
Email Reports to (will default to PM if no other addresses are listed):	
Email Invoice to (will default to PM if no other addresses are listed):	

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 NO.:

COUNTRY OF ORIGIN:

COC SEQUENCE NUMBER (Circle)
COC: 1 (2) 3 4 5 6 7
OF: 1 2 3 4 (5) 6 7

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:			

RELINQUISHED BY:	RECEIVED BY: Cameron	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME:	DATE/TIME: 9/5/17 8:00	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	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 BOTTLES	PFAS Extended Suite	Total organic Carbon	CEC (pH depend)	Metals*	PSD + % clay	Potassium	Silica	ASLP - PFAS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. *Metals Al, As, Cd, Cu, Fe, Mn, Cr, Zn
13	GW02-2.0	5/5/17	S											
14	GW02-3.0													+
15	GW02-4.0					✓	✓		✓		✓	✓		
16	GW03-0.5													
17	GW03-1.0													
18	GW03-1.5					✓	✓		✓		✓	✓	✓	
19	GW03-2.0													
20	GW03-3.0					✓	✓		✓		✓	✓		
21	GW03-4.0													
22	GW04-0.5													
23	GW04-1.0													
24	GW04-1.5					✓	✓	✓	✓	✓	✓	✓	✓	
				TOTAL										

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; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

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MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/25 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

ORANGE 4/13 Geary Place Orange NSW 2800 Ph: 02 6393 8788 E: orange@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com

WOLLONGONG 99-21 Ralph Black Drive North Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT:	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:		Custody Seal Intact?	Yes / No / N/A
PROJECT: PROJECT NO.:	ALS QUOTE NO.:	Free Ice / frozen ice bricks present upon receipt?	Yes / No / N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	Random Sample Temperature on Receipt:	°C
PROJECT MANAGER: CONTACT PH:	COC SEQUENCE NUMBER (Circle) COC: 1 2 (3) 4 5 6 7 OF: 1 2 3 4 (5) 6 7	Other comment:	
SAMPLER: SAMPLER MOBILE:	RELINQUISHED BY:	RECEIVED BY: Samuel	RELINQUISHED BY: / RECEIVED BY:
COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):	DATE/TIME:	DATE/TIME: 9/5/17 8:40	DATE/TIME: / DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed):			
Email Invoice to (will default to PM if no other addresses are listed):			

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	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 BOTTLES	PFAS Extended Suite	Total organic carbon	CEC (pH dependent)	Metals*	PSD + %Clay	Potassium	Silica	As LP PFAS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
25	GW04-2.0	5/5/17	S											* Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
26	GW04-3.0					✓	✓		✓		✓	✓	✓	
27	GW04-4.0													
28	GW05-0.2													
29	GW05-0.5					✓	✓	✓	✓		✓	✓	✓	
30	GW05-1.5													
31	GW05-2.0					✓	✓	✓	✓		✓	✓		
32	GW05-2.5									✓				
33	GW05-3.5													
34	GW06-0.2													
35	GW06-0.5													
36	GW06-1.0													
				TOTAL										

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; U = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles

CHAIN OF CUSTODY

ALS Laboratory: please tick →

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MACKAY Unit 2/26 Carmichael Drive Paget QLD 4740 Ph: 07 4952 8706 E: ALSEnviro.Mackay@alsglobal.com

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MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 5/19 Mailing Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/15 Cleary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

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SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

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WOLLONGONG 8/19-21 Ralph Black Drive North Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT:	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:			Custody Seal Intact? Yes No N/A
PROJECT: PROJECT NO.:	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free Ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: CONTACT PH:		OF: 1 2 3 4 5 6 7	Other comment:

SAMPLER: SAMPLER MOBILE:	RELINQUISHED BY:	RECEIVED BY: Cameron	RELINQUISHED BY:	RECEIVED BY:
COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):				
Email Reports to (will default to PM if no other addresses are listed):	DATE/TIME:	DATE/TIME: 9/5/17 8:40	DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed):				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	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 BOTTLES	PFAS Extended Suite	Total organic Carbon (TOC)	CEC (pH dependent)	Metals*	PSD + % Clay	Potassium	Silica	ASLP - PFAS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
37	GW06-1.5	5/5/17	S			✓	✓	✓	✓		✓	✓	✓	* Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
38	GW06-2.0													
39	GW06-2.5													
40	GW06-3.0													
41	GW06-4.0					✓	✓	✓	✓		✓	✓	✓	
42	GW07-0.2	6/5/17												
43	GW07-0.5					✓	✓	✓	✓	✓	✓	✓	✓	
44	GW07-1.0													
45	GW07-2.0													
46	GW07-3.0					✓	✓	✓	✓		✓	✓	✓	
47	GW07-4.0													
48	QA-01	5/5/17				✓								
				TOTAL										

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; U = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles

CHAIN OF CUSTODY

ALS Laboratory: please tick →

ADELAIDE 31 Burma Road Pooraka SA 5095 Ph: 08 8162 5130 E: adelaide@alsglobal.com

BRISBANE 2 Byth Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Gladstone QLD 4680 Ph: 07 4979 9444 E: ALSEnviro.Gladstone@alsglobal.com

MACKAY Unit 2/26 Carnarvon Drive Paget QLD 4740 Ph: 07 4952 9736 E: ALSEnviro.Mackay@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com

MUDGEE 1/29 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com

NEWCASTLE 2/587 Maitland Road Mayfield West NSW 2304 Ph: 02 4014 2500 E: samples.newcastle@alsglobal.com

NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 02 4423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com

TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: ALSEnviro.Townsville@alsglobal.com

WOLLONGONG 1/19-21 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: wollongong@alsglobal.com

CLIENT:	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE:		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT: PROJECT NO.:	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free Ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER: PURCHASE ORDER NO.:	COUNTRY OF ORIGIN:	COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
PROJECT MANAGER: CONTACT PH:		OF: 1 2 3 4 5 6 7	Other comment:

SAMPLER: SAMPLER MOBILE:	RELINQUISHED BY:	RECEIVED BY: Cameron	RELINQUISHED BY:	RECEIVED BY:
COC Emailed to ALS? (YES / NO) EDD FORMAT (or default):				
Email Reports to (will default to PM if no other addresses are listed):	DATE/TIME:	DATE/TIME: 9/5/17 8:40	DATE/TIME:	DATE/TIME:
Email Invoice to (will default to PM if no other addresses are listed):				

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ALS USE ONLY	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 BOTTLES	PFAS extended Suite	Total organic carbon (TOC)	CEC (pH depend)	Metals *	PSD + % clay	Potassium	Silica	ASLP - PFAS	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. * Metals: Al, As, Cd, Cu, Fe, Mn, Cr, Zn
—	QA-02	5/5/17	S			✓								→ Forward to Eurofins
49	QA-03	5/5/17	|			✓								
—	QA-04	6/5/17	|			✓	~~~	~~~	~~~		~~~	~~~	·	→ Forward to Eurofins
50	QA-05	6/5/17	|											
51	QA-06	6/5/17	|											
52	GW05-1.0	05/05/17												ON HOLD
				TOTAL										

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; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles.

Certificate of Analysis

ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsglobal.com

ALS Environmental

Brisbane, QLD

CLIENT: [redacted]

DATE REPORTED: 24-May-2017

COMPANY: GHD PTY LTD

DATE RECEIVED: 9-May-2017

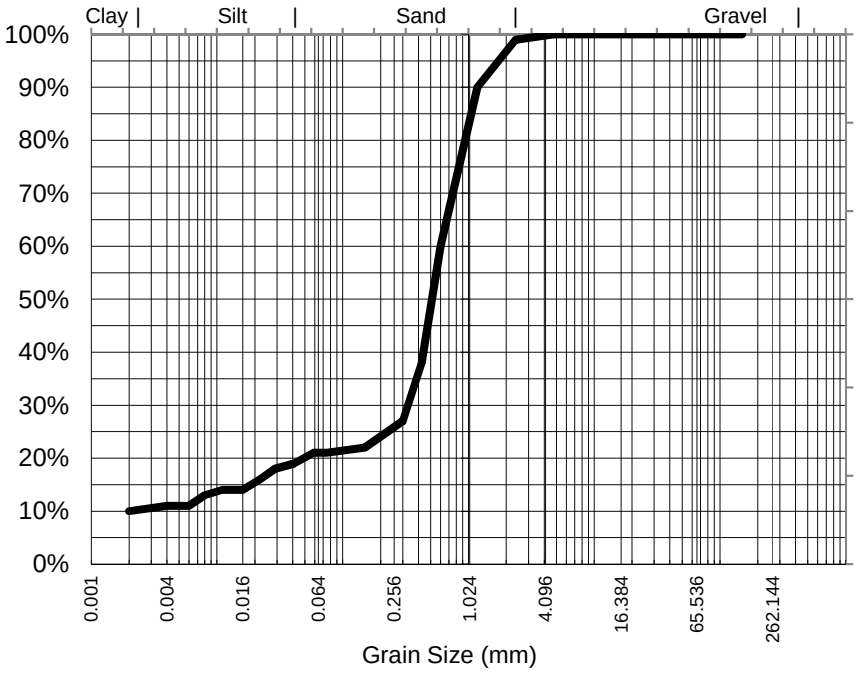
ADDRESS: GPO BOX 668
BRISBANE QLD,
AUSTRALIA 4001

REPORT NO: EB1709304-008 / PSD

PROJECT: 3134249 ASA - Cairns Airport

SAMPLE ID: GW01 - 3.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	99%
1.18	90%
0.600	60%
0.425	38%
0.300	27%
0.150	22%
0.075	21%
Particle Size (microns)	
75	21%
59	21%
41	19%
22	16%
11	14%
6	11%
2	10%

Samples analysed as received.

Median Particle Size (mm)*	0.520

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 19-May-17

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.55 g/cm3

NATA Accreditation: 825 Site: Brisbane
This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. This document shall not be reproduced, except in full.

NATA
MUTUAL RECOGNITION ARRANGEMENT ACCREDITATION

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

ALS Laboratory Group Pty Ltd
2 Byth Street, Stafford, QLD 4053
pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsglobal.com

ALS Environmental

Brisbane, QLD

CLIENT: [redacted]

DATE REPORTED: 24-May-2017

COMPANY: GHD PTY LTD

DATE RECEIVED: 9-May-2017

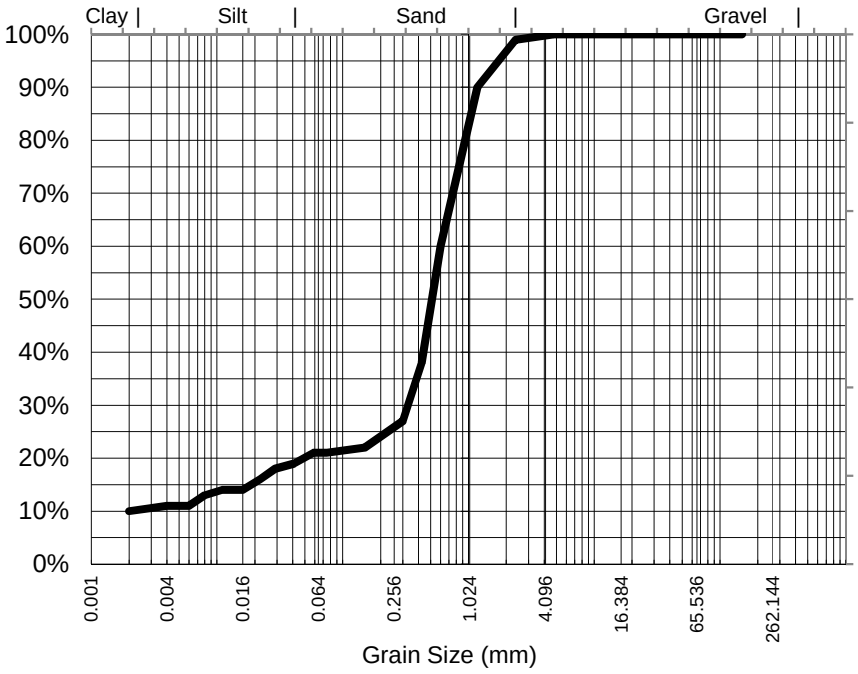
ADDRESS: GPO BOX 668
BRISBANE QLD,
AUSTRALIA 4001

REPORT NO: EB1709304-008DUP / PSD

PROJECT: 3134249 ASA - Cairns Airport

SAMPLE ID: GW01 - 3.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	99%
1.18	90%
0.600	60%
0.425	38%
0.300	27%
0.150	22%
0.075	21%
Particle Size (microns)	
75	21%
59	21%
41	19%
22	16%
11	14%
6	11%
2	10%

Samples analysed as received.

Median Particle Size (mm)*	0.520

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 19-May-17

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.55 g/cm3

NATA Accreditation: 825 Site: Brisbane
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NATA
MUTUAL RECOGNITION ARRANGEMENT ACCREDITATION

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

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pH 07 3552 8678
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ALS Environmental

Brisbane, QLD

CLIENT: [redacted]

DATE REPORTED: 24-May-2017

COMPANY: GHD PTY LTD

DATE RECEIVED: 9-May-2017

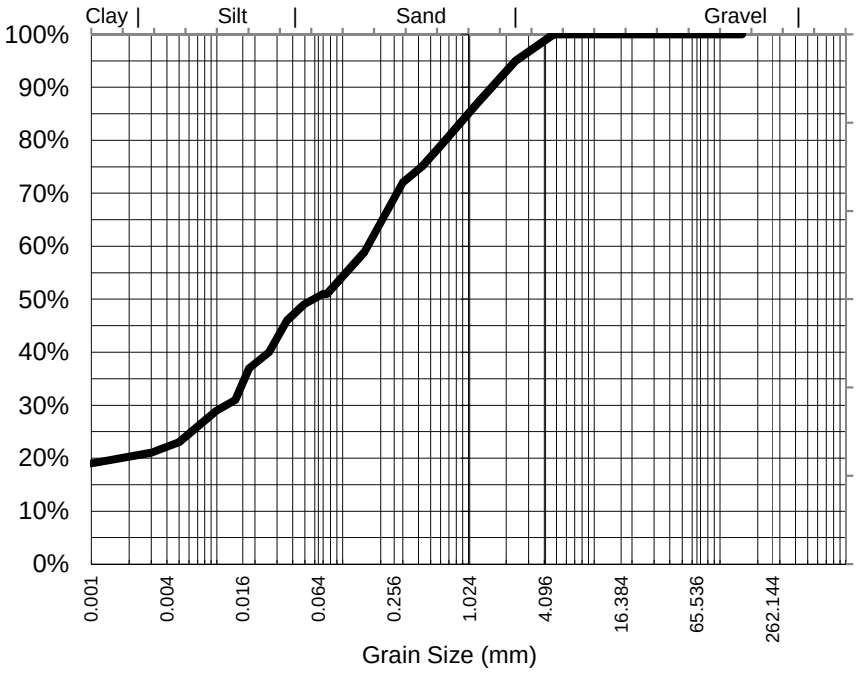
ADDRESS: GPO BOX 668
BRISBANE QLD,
AUSTRALIA 4001

REPORT NO: EB1709304-032 / PSD

PROJECT: 3134249 ASA - Cairns Airport

SAMPLE ID: GW05 - 2.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
4.75	100%
2.36	95%
1.18	87%
0.600	79%
0.425	75%
0.300	72%
0.150	59%
0.075	51%
Particle Size (microns)	
70	51%
49	49%
36	46%
18	37%
10	29%
5	23%
1	19%

Median Particle Size (mm)*	0.060

Samples analysed as received.

** Soil Particle Density results fell outside the scope of AS 1289.3.6.3. Typical sediment SPD values used for calculations and consequently, NATA endorsement does not apply to hydrometer results*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 19-May-17

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description:

Dispersion Method Shaker

Test Method: AS1289.3.6.3 2003

Hydrometer Type ASTM E100

Soil Particle Density (<2.36mm) 2.88 (2.85)* g/cm3

NATA Accreditation: 825 Site: Brisbane
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NATA
MUTUAL RECOGNITION ARRANGEMENT ACCREDITATION

Satish Trivedi
Soil Chemist
Authorised Signatory

Certificate of Analysis

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pH 07 3552 8678
fax 07 3352 3662
samples.brisbane@alsglobal.com

ALS Environmental

Brisbane, QLD

CLIENT: [redacted]

DATE REPORTED: 24-May-2017

COMPANY: GHD PTY LTD

DATE RECEIVED: 9-May-2017

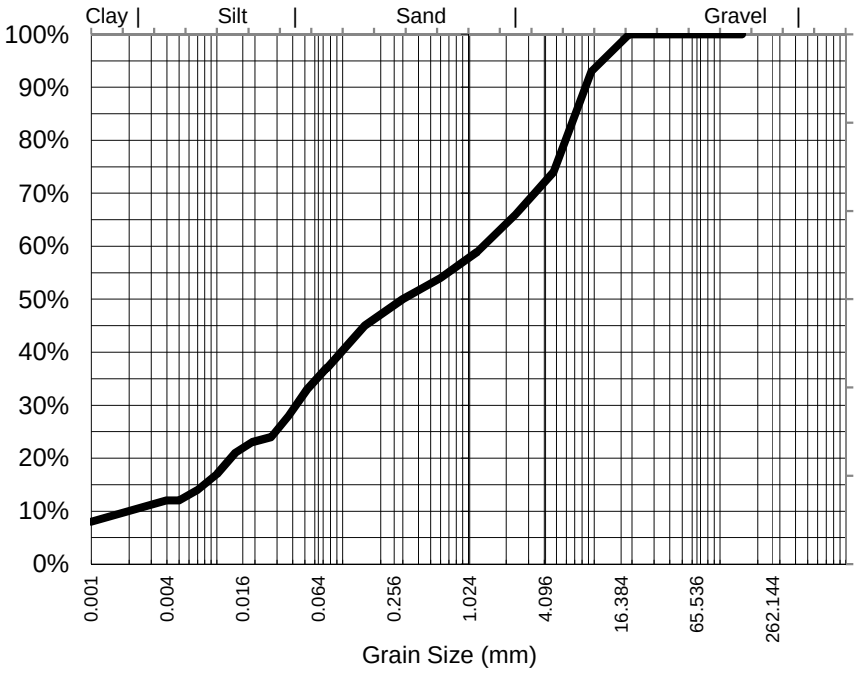
ADDRESS: GPO BOX 668
BRISBANE QLD,
AUSTRALIA 4001

REPORT NO: EB1709304-043 / PSD

PROJECT: 3134249 ASA - Cairns Airport

SAMPLE ID: GW07 - 0.5

Particle Size Distribution



Particle Size (mm)	Percent Passing
19.0	100%
9.50	93%
4.75	74%
2.36	66%
1.18	59%
0.600	54%
0.425	52%
0.300	50%
0.150	45%
0.075	37%
Particle Size (microns)	
74	37%
52	33%
37	28%
19	23%
10	17%
5	12%
1	8%

Samples analysed as received.

Median Particle Size (mm)*	0.300

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Loss on Pretreatment NA

Sample Description:

Test Method: AS1289.3.6.3 2003

Soil Particle Density (<2.36mm) 2.83 g/cm3

Analysed: 19-May-17

Limit of Reporting: 1%

Dispersion Method Shaker

Hydrometer Type ASTM E100

Satish Trivedi
Soil Chemist
Authorised Signatory

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB1710666**	Page	: 1 of 12
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: [redacted]	Telephone	: +61-7-3243 7222
Project	: ASA	Date Samples Received	: 25-May-2017 08:05
Order number	: 3134249	Date Analysis Commenced	: 26-May-2017
C-O-C number	: ----	Issue Date	: 09-Jun-2017 10:22
Sampler	: [redacted]		
Site	: ----		
Quote number	: EN/005/16		
No. of samples received	: 16		
No. of samples analysed	: 16		

ilac-MRA NATA
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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Greg Vogel	Laboratory Manager	Stafford Minerals - ST, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by 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 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.

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

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

- ED006 (Exchangeable Cations on Alkaline Soils): It is recognised that the Exchangeable K LCS biases low, however this is deemed acceptable as the target concentration is at LOR and the Cation Exchange Capacity LCS is within acceptable limits.
- EG005T (Total Metals by ICP-AES): Sample EB1710666-014 (SS01) shows poor spike recovery due to sample heterogeneity. Confirmed by visual inspection.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- EP231: Particular samples required dilution due to sample matrix . LOR values have been adjusted accordingly.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SS01	SS02	SS04	----	----
			Client sampling date / time	23-May-2017 00:00	23-May-2017 00:00	23-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit	EB1710666-014	EB1710666-015	EB1710666-016	--------	--------
				Result	Result	Result	----	----
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.8	6.9	7.7	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	2670	4170	2380	----	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	42.8	49.8	29.5	----	----
ED006: Exchangeable Cations on Alkaline Soils								
Exchangeable Calcium	----	0.2	meq/100g	0.8	----	0.8	----	----
Exchangeable Magnesium	----	0.2	meq/100g	3.1	----	2.2	----	----
Exchangeable Potassium	----	0.2	meq/100g	0.6	----	0.3	----	----
Exchangeable Sodium	----	0.2	meq/100g	2.6	----	1.6	----	----
Cation Exchange Capacity	----	0.2	meq/100g	7.2	----	4.9	----	----
Exchangeable Sodium Percent	----	0.2	%	36.7	----	32.1	----	----
Calcium/Magnesium Ratio	----	0.2	-	0.3	----	0.4	----	----
Magnesium/Potassium Ratio	----	0.2	-	5.6	----	8.0	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	4.0	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	9.5	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	1.5	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	2.9	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	18.0	----	----	----
Exchangeable Sodium Percent	----	0.1	%	----	16.3	----	----	----
Calcium/Magnesium Ratio	----	0.1	-	----	0.4	----	----	----
Magnesium/Potassium Ratio	----	0.1	-	----	6.3	----	----	----
ED093S: Soluble Major Cations								
Potassium	7440-09-7	10	mg/kg	240	470	170	----	----
EG005T: Total Metals by ICP-AES								
Aluminium	7429-90-5	50	mg/kg	15100	16100	8690	----	----
Arsenic	7440-38-2	5	mg/kg	25	30	9	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	31	37	19	----	----
Copper	7440-50-8	5	mg/kg	24	20	10	----	----
Iron	7439-89-6	50	mg/kg	37900	55800	14700	----	----
Manganese	7439-96-5	5	mg/kg	1700	324	245	----	----
Zinc	7440-66-6	5	mg/kg	69	103	36	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SS01	SS02	SS04	----	----
				Client sampling date / time	23-May-2017 00:00	23-May-2017 00:00	23-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710666-014	EB1710666-015	EB1710666-016	--------	--------
					Result	Result	Result	----	----
EP003: Total Organic Carbon (TOC) in Soil									
Total Organic Carbon	----	0.02	%		**0.76**	**1.67**	**0.88**	**----**	**----**
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		**0.0031**	**0.0010**	**0.0010**	**----**	**----**
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 (PFTrDA)	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)				Client sample ID	SS01	SS02	SS04	----	----
				Client sampling date / time	23-May-2017 00:00	23-May-2017 00:00	23-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710666-014	EB1710666-015	EB1710666-016	--------	--------
					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)	2448-09-7	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		**0.0031**	**0.0012**	**0.0010**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0031**	**0.0010**	**0.0010**	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0031**	**0.0010**	**0.0010**	----	----
ME-ICP81: Silica and Metals Oxides by Peroxide Fusion									
Silica as SiO2	7631-86-9	0.01	%		**68.7**	**58.6**	**79.6**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**98.8**	**95.9**	**99.4**	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GW01	GW02	GW03	GW04	GW05
				Client sampling date / time	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710666-001	EB1710666-002	EB1710666-003	EB1710666-004	EB1710666-005
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**1030**	**6910**	**53800**	**585**	**2010**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**222**	**314**	**1090**	<1	**298**
Total Alkalinity as CaCO3	----	1	mg/L		**222**	**314**	**1090**	<1	**298**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.86**	**6.27**	**0.27**	**0.04**	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**1.32**	**6.55**	**0.14**	**0.05**	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**13.3**	**34.4**	**0.10**	**0.28**	**0.03**
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**1.57**	**5.17**	<0.05	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**29.6**	**101**	**0.14**	**0.03**	**0.19**
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	**0.03**	<0.05	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		**0.4**	**4.5**	**0.4**	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**0.54**	**15.2**	**0.10**	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**2.37**	**20.6**	**0.64**	**0.03**	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.38**	**4.30**	<0.05	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**1.34**	**6.82**	<0.05	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	**0.62**	<0.05	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	**0.10**	<0.05	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GW01	GW02	GW03	GW04	GW05
				Client sampling date / time	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710666-001	EB1710666-002	EB1710666-003	EB1710666-004	EB1710666-005
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	**0.27**	<0.05	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.05	<0.12	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.02	<0.05	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.05	<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	**0.82**	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	**3.33**	<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		**51.7**	**210**	**1.79**	**0.43**	**0.22**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**42.9**	**135**	**0.24**	**0.31**	**0.22**
Sum of PFAS (WA DER List)	----	0.01	µg/L		**48.8**	**197**	**1.65**	**0.38**	**0.22**
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**96.3**	**106**	**106**	**106**	**103**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GW06	GW07	EW03	QA-01	SW01
				Client sampling date / time	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710666-006	EB1710666-007	EB1710666-008	EB1710666-009	EB1710666-010
					Result	Result	Result	Result	Result
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**9220**	**48800**	**206**	**179**	**39100**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**265**	**1360**	**48**	**43**	**132**
Total Alkalinity as CaCO3	----	1	mg/L		**265**	**1360**	**48**	**43**	**132**
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.05	**0.20**	**0.20**	<0.05
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.05	**0.27**	**0.28**	<0.05
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		**0.02**	<0.05	**2.34**	**2.41**	<0.05
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.05	**0.21**	**0.20**	<0.05
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**0.02**	<0.05	**5.23**	**4.90**	<0.05
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	<0.2	<0.1	<0.1	<0.2
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	<0.05	**0.18**	**0.17**	<0.05
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.02	<0.05	**0.65**	**0.67**	<0.05
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	<0.05	**0.18**	**0.19**	<0.05
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.01	<0.05	**0.31**	**0.32**	<0.05
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	<0.12	<0.05	<0.05	<0.12

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	GW06	GW07	EW03	QA-01	SW01
				Client sampling date / time	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00	22-May-2017 00:00
Compound	CAS Number	LOR	Unit		EB1710666-006	EB1710666-007	EB1710666-008	EB1710666-009	EB1710666-010
					Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	<0.12	<0.05	<0.05	<0.12
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	<0.12	<0.05	<0.05	<0.12
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.05	<0.12	<0.05	<0.05	<0.12
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	<0.12	<0.05	<0.05	<0.12
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.05	<0.02	<0.02	<0.05
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**0.04**	<0.05	**9.57**	**9.34**	<0.05
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**0.04**	<0.05	**7.57**	**7.31**	<0.05
Sum of PFAS (WA DER List)	----	0.01	µg/L		**0.04**	<0.05	**9.09**	**8.86**	<0.05
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**100**	**104**	**105**	**97.4**	**101**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW02	SW03	SW04	----	----
				Client sampling date / time	22-May-2017 00:00	23-May-2017 00:00	23-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710666-011	EB1710666-012	EB1710666-013	--------	--------
					Result	Result	Result	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**30900**	**29900**	**12800**	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**191**	**199**	**90**	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**191**	**199**	**90**	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		<0.05	<0.05	**0.10**	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.05	<0.05	<0.05	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.2	<0.2	<0.2	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.05	<0.05	<0.05	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.12	<0.12	<0.12	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Client sample ID	SW02	SW03	SW04	----	----
				Client sampling date / time	22-May-2017 00:00	23-May-2017 00:00	23-May-2017 00:00	----	----
Compound	CAS Number	LOR	Unit		EB1710666-011	EB1710666-012	EB1710666-013	--------	--------
					Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.12	<0.12	<0.12	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.12	<0.12	<0.12	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L		<0.12	<0.12	<0.12	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.12	<0.12	<0.12	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.05	<0.05	<0.05	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.05	<0.05	**0.10**	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.05	<0.05	**0.10**	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.05	<0.05	**0.10**	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**103**	**96.7**	**108**	----	----

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	70	130

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	130

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EB1710666**	Page	: 1 of 12
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: [redacted]	Telephone	: +61-7-3243 7222
Project	: ASA	Date Samples Received	: 25-May-2017
Order number	: 3134249	Date Analysis Commenced	: 26-May-2017
C-O-C number	: ----	Issue Date	: 09-Jun-2017
Sampler	: [redacted]		
Site	: ----		
Quote number	: EN/005/16		
No. of samples received	: 16		
No. of samples analysed	: 16		

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. 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*
Alex Rossi	Organic Chemist	Sydney Organics, Smithfield, NSW
Andrew Epps	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Acid Sulphate Soils, Stafford, QLD
Greg Vogel	Laboratory Manager	Brisbane Inorganics, Stafford, QLD
Greg Vogel	Laboratory Manager	Stafford Minerals - ST, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils, Stafford, QLD
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA002 : pH (Soils) (QC Lot: 912028)									
EB1710666-016	SS04	EA002: pH Value	----	0.1	pH Unit	7.7	7.6	0.00	0% - 20%
EB1710417-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.9	6.9	0.00	0% - 20%
EA010: Conductivity (QC Lot: 912029)									
EB1710507-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	138	135	2.49	0% - 20%
EA055: Moisture Content (QC Lot: 912033)									
EB1710417-001	Anonymous	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	16.7	17.5	4.76	0% - 50%
EB1710666-016	SS04	EA055-103: Moisture Content (dried @ 103°C)	----	1	%	29.5	31.1	5.43	0% - 20%
ED006: Exchangeable Cations on Alkaline Soils (QC Lot: 913253)									
EB1710666-014	SS01	ED006: Exchangeable Calcium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED006: Exchangeable Magnesium	----	0.1	meq/100g	3.1	3.3	4.32	0% - 50%
		ED006: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED006: Exchangeable Sodium	----	0.1	meq/100g	2.6	2.8	5.07	0% - 50%
		ED006: Cation Exchange Capacity	----	0.1	meq/100g	7.2	7.4	3.30	0% - 20%
ED008: Exchangeable Cations (QC Lot: 913256)									
EB1710666-015	SS02	ED008: Exchangeable Calcium	----	0.1	meq/100g	4.0	4.0	0.00	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	9.5	9.5	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	1.5	1.5	0.00	0% - 50%
		ED008: Exchangeable Sodium	----	0.1	meq/100g	2.9	2.9	0.00	0% - 20%
ED093S: Soluble Major Cations (QC Lot: 912031)									
EB1710666-014	SS01	ED093S: Potassium	7440-09-7	10	mg/kg	240	220	7.65	0% - 20%
EG005T: Total Metals by ICP-AES (QC Lot: 912420)									
EB1710411-011	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	4	4	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	15	17	11.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	163	162	0.00	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EG005T: Total Metals by ICP-AES (QC Lot: 912420) - continued									
EB1710411-011	Anonymous	EG005T: Copper	7440-50-8	5	mg/kg	297	309	3.94	0% - 20%
		EG005T: Manganese	7439-96-5	5	mg/kg	1040	1070	3.49	0% - 20%
		EG005T: Zinc	7440-66-6	5	mg/kg	632	650	2.66	0% - 20%
		EG005T: Aluminium	7429-90-5	50	mg/kg	10200	10600	4.50	0% - 20%
		EG005T: Iron	7439-89-6	50	mg/kg	22000	22800	3.38	0% - 20%
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 930966)									
EB1710666-014	SS01	EP003: Total Organic Carbon	----	0.02	%	0.76	0.77	2.03	0% - 20%
EB1711046-008	Anonymous	EP003: Total Organic Carbon	----	0.02	%	1.63	1.77	8.15	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 917326)									
EB1710666-014	SS01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0031	0.0027	13.6	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 917326)									
EB1710666-014	SS01	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 917326)									
EB1710666-014	SS01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 917326) - continued									
EB1710666-014	SS01	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 917326)									
EB1710666-014	SS01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 909263)									
EB1710582-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	293	296	0.906	0% - 20%
EB1710637-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	538	511	5.02	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 909264)									
EB1710666-011	SW02	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	30900	30600	0.894	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 910621)									
EB1710666-001	GW01	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	222	226	1.63	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	222	226	1.63	0% - 20%
EB1710666-010	SW01	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	132	131	0.826	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	132	131	0.826	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 916956)									
EB1710666-001	GW01	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	29.6	29.7	0.506	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.86	0.86	0.00	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	1.32	1.29	2.53	0% - 20%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	13.3	13.5	1.86	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	1.57	1.48	6.02	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EB1710666-009	QA-01	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	4.90	4.89	0.327	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.20	0.20	0.00	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.28	0.28	0.00	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	2.41	2.50	3.83	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.20	0.22	10.4	0% - 50%

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 916956) - continued									
EB1710666-009	QA-01	EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 916956)									
EB1710666-001	GW01	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	1.34	1.27	4.83	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.54	0.50	6.76	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	2.37	2.31	2.61	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.38	0.37	2.67	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.4	0.4	0.00	No Limit
EB1710666-009	QA-01	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.32	0.29	8.50	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.17	0.18	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.67	0.68	0.00	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.19	0.18	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 916956)									
EB1710666-001	GW01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EB1710666-009	QA-01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 916956) - continued									
EB1710666-009	QA-01	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 916956)									
EB1710666-001	GW01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EB1710666-009	QA-01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 916956)									
EB1710666-001	GW01	EP231X: Sum of PFAS	----	0.01	µg/L	51.7	51.7	0.00	0% - 20%
EB1710666-009	QA-01	EP231X: Sum of PFAS	----	0.01	µg/L	9.34	9.42	0.853	0% - 20%

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

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

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA002 : pH (Soils) (QCLot: 912028)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	98	102
				----	7 pH Unit	100	98	102
EA010: Conductivity (QCLot: 912029)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	99.9	97	103
ED006: Exchangeable Cations on Alkaline Soils (QCLot: 913253)								
ED006: Exchangeable Calcium	----	0.1	meq/100g	<0.1	4.7161 meq/100g	100	70	130
ED006: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.7407 meq/100g	100	70	130
ED006: Exchangeable Potassium	----	0.1	meq/100g	<0.1	----	----	----	----
ED006: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.5971 meq/100g	99.5	70	130
ED006: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	7.2788 meq/100g	99.6	70	130
ED008: Exchangeable Cations (QCLot: 913256)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	10.925 meq/100g	104	91	109
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	5.9518 meq/100g	91.3	89	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.4769 meq/100g	88.5	79	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.8718 meq/100g	96.9	75	118
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	18.2255 meq/100g	100	88	110
ED093S: Soluble Major Cations (QCLot: 912031)								
ED093S: Potassium	7440-09-7	10	mg/kg	<10	500 mg/kg	102	80	120
EG005T: Total Metals by ICP-AES (QCLot: 912420)								
EG005T: Aluminium	7429-90-5	50	mg/kg	<50	----	----	----	----
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	118.9 mg/kg	110	84	123
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.87125 mg/kg	115	88	117
EG005T: Chromium	7440-47-3	2	mg/kg	<2	22.7 mg/kg	112	83	125
EG005T: Copper	7440-50-8	5	mg/kg	<5	55 mg/kg	115	86	122
EG005T: Iron	7439-89-6	50	mg/kg	<50	34900 mg/kg	95.5	70	120
EG005T: Manganese	7439-96-5	5	mg/kg	<5	604.6 mg/kg	112	84	113
EG005T: Zinc	7440-66-6	5	mg/kg	<5	182.3 mg/kg	120	87	127
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 930966)								
EP003: Total Organic Carbon	----	0.02	%	<0.02	100 %	99.4	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 917326)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.3	57	121
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.5	55	125
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	52	126

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 917326) - continued								
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	54	123
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	111	55	127
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	54	125
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 917326)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	105	52	128
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	54	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.0	58	127
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	57	128
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	60	134
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	63	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	55	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	124	62	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.6	53	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.7	49	129
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	59	129
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 917326)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	52	132
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	114	65	126
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	92.1	64	126
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.3	63	124
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	87.8	58	125
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.3	61	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	55	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 917326)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	110	54	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	103	61	130
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	110	62	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	105	60	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 909263)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	293 mg/L	99.5	88	112
				<10	2000 mg/L	94.8	88	112

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 909264)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	293 mg/L	106	88	112
				<10	2000 mg/L	94.0	88	112
ED037P: Alkalinity by PC Titrator (QCLot: 910621)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	101	80	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 916956)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.5 µg/L	94.8	70	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.5 µg/L	110	70	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.5 µg/L	84.8	70	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.5 µg/L	113	70	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.5 µg/L	112	70	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.5 µg/L	117	70	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 916956)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	2.5 µg/L	90.8	70	130
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.5 µg/L	102	70	130
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.5 µg/L	114	70	130
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.5 µg/L	118	70	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.5 µg/L	123	70	130
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.5 µg/L	124	70	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.5 µg/L	125	70	130
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.5 µg/L	123	70	130
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.5 µg/L	125	70	130
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.5 µg/L	112	70	130
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	1.25 µg/L	81.6	70	124
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 916956)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.5 µg/L	114	70	130
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	1.25 µg/L	118	70	130
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	1.25 µg/L	114	70	129
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.05	µg/L	<0.05	1.25 µg/L	114	70	129
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	1.25 µg/L	115	70	126
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.5 µg/L	121	70	130
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.5 µg/L	120	70	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 916956)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.5 µg/L	115	70	130
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.5 µg/L	121	70	130

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 916956) - continued								
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.5 µg/L	116	70	130
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.5 µg/L	116	70	130

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**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005T: Total Metals by ICP-AES (QCLot: 912420)							
EB1710666-014	SS01	EG005T: Arsenic	7440-38-2	50 mg/kg	124	70	130
		EG005T: Cadmium	7440-43-9	25 mg/kg	121	70	130
		EG005T: Chromium	7440-47-3	50 mg/kg	124	70	130
		EG005T: Copper	7440-50-8	50 mg/kg	126	70	130
		EG005T: Manganese	7439-96-5	50 mg/kg	# Not Determined	70	130
		EG005T: Zinc	7440-66-6	50 mg/kg	# 135	70	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 917326)							
EB1710666-014	SS01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	73.1	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	59.2	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	61.2	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	82.8	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	107	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	101	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 917326)							
EB1710666-014	SS01	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	94.3	30	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	80.7	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	63.9	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	98.1	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	107	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	119	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	109	50	130
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	88.4	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	64.5	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	112	30	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	113	30	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 917326)							

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 917326) - continued							
EB1710666-014	SS01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	98.0	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	111	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	79.7	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	0.00312 mg/kg	75.9	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	68.7	30	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	109	30	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	119	30	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 917326)							
EB1710666-014	SS01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	80.7	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	93.2	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	112	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	87.0	50	130

Sub-Matrix: **WATER**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	Matrix Spike (MS) Report: SpikeRecovery(%) MS	Matrix Spike (MS) Report: Recovery Limits (%) Low	Matrix Spike (MS) Report: Recovery Limits (%) High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 916956)							
EB1710666-001	GW01	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.5 µg/L	78.6	50	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.5 µg/L	92.8	50	130
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.5 µg/L	# Not Determined	50	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.5 µg/L	107	50	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.5 µg/L	# Not Determined	50	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.5 µg/L	103	50	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 916956)							
EB1710666-001	GW01	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	2.5 µg/L	82.0	50	130
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.5 µg/L	110	50	130
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.5 µg/L	# Not Determined	50	130
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.5 µg/L	101	50	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.5 µg/L	97.0	50	130
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.5 µg/L	85.2	50	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.5 µg/L	102	50	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 916956) - continued							
EB1710666-001	GW01	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.5 µg/L	102	50	130
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.5 µg/L	91.8	50	130
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.5 µg/L	70.6	50	130
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	1.25 µg/L	71.4	50	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 916956)							
EB1710666-001	GW01	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.5 µg/L	120	50	130
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	1.25 µg/L	115	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	1.25 µg/L	116	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7	1.25 µg/L	99.6	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	1.25 µg/L	112	50	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.5 µg/L	96.6	50	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.5 µg/L	92.6	50	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 916956)							
EB1710666-001	GW01	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.5 µg/L	96.0	50	130
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.5 µg/L	118	50	130
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.5 µg/L	120	50	130
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.5 µg/L	85.8	50	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EB1710666**	Page	: 1 of 9
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Telephone	: +61-7-3243 7222
Project	: ASA	Date Samples Received	: 25-May-2017
Site	: ----	Issue Date	: 09-Jun-2017
Sampler	: [redacted]	No. of samples received	: 16
Order number	: 3134249	No. of samples analysed	: 16

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

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

Summary of Outliers

Outliers : Quality Control Samples

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

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

Outliers : Analysis Holding Time Compliance

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

Outliers : Frequency of Quality Control Samples

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

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EG005T: Total Metals by ICP-AES	EB1710666--014	SS01	**Manganese**	7439-96-5	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EG005T: Total Metals by ICP-AES	EB1710666--014	SS01	**Zinc**	7440-66-6	135 %	70-130%	**Recovery greater than upper data quality objective**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EB1710666--001	GW01	**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	EB1710666--001	GW01	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EP231B: Perfluoroalkyl Carboxylic Acids	EB1710666--001	GW01	**Perfluorohexanoic acid (PFHxA)**	307-24-4	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **SOIL**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Exchangeable Cations on Alkaline Soils	0	2	0.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

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

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

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

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

Matrix: **SOIL**

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

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

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002 : pH (Soils)							
Soil Glass Jar - Unpreserved (EA002)							
SS01, SS02, SS04	**23-May-2017**	**27-May-2017**	30-May-2017	✓	**27-May-2017**	27-May-2017	✓
EA010: Conductivity							
Soil Glass Jar - Unpreserved (EA010)							
SS01, SS02, SS04	**23-May-2017**	**27-May-2017**	30-May-2017	✓	**27-May-2017**	24-Jun-2017	✓
EA055: Moisture Content							
Soil Glass Jar - Unpreserved (EA055-103)							
SS01, SS02, SS04	**23-May-2017**	**----**	----	----	**26-May-2017**	06-Jun-2017	✓
ED006: Exchangeable Cations on Alkaline Soils							
Soil Glass Jar - Unpreserved (ED006)							
SS01, SS04	**23-May-2017**	**05-Jun-2017**	20-Jun-2017	✓	**06-Jun-2017**	20-Jun-2017	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008)							
SS02	**23-May-2017**	**05-Jun-2017**	20-Jun-2017	✓	**06-Jun-2017**	20-Jun-2017	✓
ED093S: Soluble Major Cations							
Soil Glass Jar - Unpreserved (ED093S)							
SS01, SS02, SS04	**23-May-2017**	**27-May-2017**	19-Nov-2017	✓	**30-May-2017**	19-Nov-2017	✓
EG005T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T)							
SS01, SS02, SS04	**23-May-2017**	**29-May-2017**	19-Nov-2017	✓	**29-May-2017**	19-Nov-2017	✓
EP003: Total Organic Carbon (TOC) in Soil							
Pulp Bag (EP003)							
SS01, SS02, SS04	**23-May-2017**	**07-Jun-2017**	20-Jun-2017	✓	**07-Jun-2017**	20-Jun-2017	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
SS01, SS02, SS04	**23-May-2017**	**01-Jun-2017**	19-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
SS01, SS02, SS04	**23-May-2017**	**01-Jun-2017**	19-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X)							
SS01, SS02, SS04	**23-May-2017**	**01-Jun-2017**	19-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓

Matrix: **SOIL**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
SS01, SS02, SS04	**23-May-2017**	**01-Jun-2017**	19-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
SS01, SS02, SS04	**23-May-2017**	**01-Jun-2017**	19-Nov-2017	✓	**01-Jun-2017**	11-Jul-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
GW01, GW02, GW03, GW04, GW05, GW06, GW07, EW03, QA-01, SW01, SW02	**22-May-2017**	**----**	----	----	**26-May-2017**	29-May-2017	✓
Clear Plastic Bottle - Natural (EA015H)							
SW03, SW04	**23-May-2017**	**----**	----	----	**26-May-2017**	30-May-2017	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
GW01, GW02, GW03, GW04, GW05, GW06, GW07, EW03, QA-01, SW01, SW02	**22-May-2017**	**----**	----	----	**27-May-2017**	05-Jun-2017	✓
Clear Plastic Bottle - Natural (ED037-P)							
SW03, SW04	**23-May-2017**	**----**	----	----	**27-May-2017**	06-Jun-2017	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
GW01, GW02, GW03, GW04, GW05, GW06, GW07, EW03, QA-01, SW01, SW02	**22-May-2017**	**----**	----	----	**31-May-2017**	18-Nov-2017	✓
HDPE (no PTFE) (EP231X)							
SW03, SW04	**23-May-2017**	**----**	----	----	**31-May-2017**	19-Nov-2017	✓

Matrix: **WATER**

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

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
GW01, GW02, GW03, GW04, GW05, GW06, GW07, EW03, QA-01, SW01, SW02	**22-May-2017**	**----**	----	----	**31-May-2017**	18-Nov-2017	✓
HDPE (no PTFE) (EP231X)							
SW03, SW04	**23-May-2017**	**----**	----	----	**31-May-2017**	19-Nov-2017	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
GW01, GW02, GW03, GW04, GW05, GW06, GW07, EW03, QA-01, SW01, SW02	**22-May-2017**	**----**	----	----	**31-May-2017**	18-Nov-2017	✓
HDPE (no PTFE) (EP231X)							
SW03, SW04	**23-May-2017**	**----**	----	----	**31-May-2017**	19-Nov-2017	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
GW01, GW02, GW03, GW04, GW05, GW06, GW07, EW03, QA-01, SW01, SW02	**22-May-2017**	**----**	----	----	**31-May-2017**	18-Nov-2017	✓
HDPE (no PTFE) (EP231X)							
SW03, SW04	**23-May-2017**	**----**	----	----	**31-May-2017**	19-Nov-2017	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
GW01, GW02, GW03, GW04, GW05, GW06, GW07, EW03, QA-01, SW01, SW02	**22-May-2017**	**----**	----	----	**31-May-2017**	18-Nov-2017	✓
HDPE (no PTFE) (EP231X)							
SW03, SW04	**23-May-2017**	**----**	----	----	**31-May-2017**	19-Nov-2017	✓

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)							
Cations - soluble by ICP-AES	ED093S	1	3	33.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	2	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	100.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055-103	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	4	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Cations - soluble by ICP-AES	ED093S	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	11	18.18	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Cations - soluble by ICP-AES	ED093S	1	3	33.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Electrical Conductivity (1:5)	EA010	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	1	2	50.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	100.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	5	20.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations on Alkaline Soils	ED006	0	2	0.00	10.00	×	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							

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) - Continued							
Alkalinity by PC Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	26	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

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

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 103)
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM (2013) Schedule B(3) (Method 104)
Moisture Content	EA055-103	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (2013) Schedule B(3) Section 7.1 and Table 1 (14 day holding time).
Exchangeable Cations on Alkaline Soils	ED006	SOIL	In house: Referenced to Soil Survey Test Method C5. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with alcoholic ammonium chloride at pH 8.5. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil.
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Higginson (2011) Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (2013) Schedule B(3) (Method 301)
Cations - soluble by ICP-AES	ED093S	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010 (ICPAES) Water extracts of the soil are analyzed for major cations by ICPAES. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (2013) Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-House. A portion of soil is extracted with MTBE. The extract is taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.
Sodium Peroxide fusion - ICPAES finish	ME-ICP81x	SOIL	Analysis conducted by ALS Minerals.
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM (2013) Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In house: Direct injection analysis of fresh waters after dilution (1:1) with methanol. Analysis by LC-Electrospray-MS-MS, Negative Mode using MRM. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method (Alkaline Soils)	ED006PR	SOIL	In house: Referenced to Rayment and Lyons 2011 method 15C1.
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Higginson (1992) method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of distilled water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (2013) Schedule B(3) (Method 202)
Sample Extraction for PFAS	EP231-PR	SOIL	In house
Dry and Pulverise (up to 100g)	GEO30	SOIL	#

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EB1710666**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: [redacted]	Contact	: Vanessa Mattes
Address	: GPO BOX 668 BRISBANE QLD, AUSTRALIA 4001	Address	: 2 Byth Street Stafford QLD Australia 4053
E-mail	: [redacted]	[redacted]	[redacted]
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Facsimile	: [redacted]	Facsimile	: +61-7-3243 7218
Project	: ASA	Page	: 1 of 3
Order number	: 3134249	Quote number	: ES2015GHDSER0820 (EN/005/15)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: [redacted]		

Dates

Date Samples Received	: 25-May-2017 08:05	Issue Date	: 25-May-2017
Client Requested Due Date	: 08-Jun-2017	Scheduled Reporting Date	: **30-May-2017**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 2	Temperature	: 2.2, 1.6°C - Ice present
Receipt Detail	:	No. of samples received / analysed	: 16 / 16

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Discounted Package Prices apply only when specific ALS Group Codes ('W', 'S', 'NT' suites) are referenced on COCs.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911 (Micro site no. 14913).**
- **Where 'Cation Exchange Capacity' has been referenced, pH and electrical conductivity have been assigned as the results for these methods will be used to determine the correct method for analysis. Once the correct method has been determined, CEC will be added to this work order.**
- **Silica analysis will be conducted by ALS Minerals, Brisbane, NATA accreditation no. 825, Site No. 818.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (14 days), Solid (60 days) from date of completion of work order.
- Analysis will be conducted by ALS Environmental, Brisbane, NATA accreditation no. 825, Site No. 818 (Micro site no. 18958).
- **Breaches in recommended extraction / analysis holding times (if any) are displayed overleaf in the Proactive Holding Time Report table.**
- **Sample 'QA-02' has been forwarded to Eurofins as requested.**

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	Client sampling date / time	Client sample ID	SOIL - ALS TYPED REPORT_SOIL (Subcontracted)	SOIL - EA010 (solids): Electrical Conductivity (1:5)	SOIL - EA055-103 Moisture Content	SOIL - ED093S Cations - Soluble
EB1710666-014	23-May-2017 00:00	SS01	✓	✓	✓	✓
EB1710666-015	23-May-2017 00:00	SS02	✓	✓	✓	✓
EB1710666-016	23-May-2017 00:00	SS04	✓	✓	✓	✓

Matrix: **SOIL**

Laboratory sample ID	Client sampling date / time	Client sample ID	SOIL - EA002 pH (1:5)	SOIL - EG005T (solids) Total Metals by ICP-AES	SOIL - EP003 Total Organic Carbon (TOC) in Soil	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)	SOIL - ME-ICP81 (Subcontracted) Silica by Peroxide fusion - ICPAES finish
EB1710666-014	23-May-2017 00:00	SS01	✓	✓	✓	✓	✓
EB1710666-015	23-May-2017 00:00	SS02	✓	✓	✓	✓	✓
EB1710666-016	23-May-2017 00:00	SS04	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Client sampling date / time	Client sample ID	WATER - EA015H Total Dissolved Solids - High Level	WATER - ED037-P Alkalinity as CaCO3 (PCT)	WATER - EP231X PFAS - Full Suite (28 analytes)
EB1710666-001	22-May-2017 00:00	GW01	✓	✓	✓
EB1710666-002	22-May-2017 00:00	GW02	✓	✓	✓
EB1710666-003	22-May-2017 00:00	GW03	✓	✓	✓
EB1710666-004	22-May-2017 00:00	GW04	✓	✓	✓

			WATER - EA015H Total Dissolved Solids - High Level	WATER - ED037-P Alkalinity as CaCO3 (PCT)	WATER - EP231X PFAS - Full Suite (28 analytes)
EB1710666-005	22-May-2017 00:00	GW05	✓	✓	✓
EB1710666-006	22-May-2017 00:00	GW06	✓	✓	✓
EB1710666-007	22-May-2017 00:00	GW07	✓	✓	✓
EB1710666-008	22-May-2017 00:00	EW03	✓	✓	✓
EB1710666-009	22-May-2017 00:00	QA-01	✓	✓	✓
EB1710666-010	22-May-2017 00:00	SW01	✓	✓	✓
EB1710666-011	22-May-2017 00:00	SW02	✓	✓	✓
EB1710666-012	23-May-2017 00:00	SW03	✓	✓	✓
EB1710666-013	23-May-2017 00:00	SW04	✓	✓	✓

Proactive Holding Time Report

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

Requested Deliverables

ACCOUNTS PAYABLE (Brisbane)

- A4 - AU Tax Invoice (INV) — Email — ap-fss@ghd.com

[redacted]

- *AU Certificate of Analysis - NATA (COA) — Email — [redacted]
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) — Email — [redacted]
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) — Email — [redacted]
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) — Email — [redacted]
- Attachment - Report (SUBCO) — Email — [redacted]
- Chain of Custody (CoC) (COC) — Email — [redacted]
- EDI Format - ENMRG (ENMRG) — Email — [redacted]
- EDI Format - ESDAT (ESDAT) — Email — [redacted]
- EDI Format - XTab (XTAB) — Email — [redacted]
- Electronic SRN for ESdat (ESRN_ESDAT) — Email — [redacted]

[redacted]

- *AU Certificate of Analysis - NATA (COA) — Email — [redacted]
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI) — Email — [redacted]
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC) — Email — [redacted]
- A4 - AU Sample Receipt Notification - Environmental HT (SRN) — Email — [redacted]
- A4 - AU Tax Invoice (INV) — Email — [redacted]
- Attachment - Report (SUBCO) — Email — [redacted]
- Chain of Custody (CoC) (COC) — Email — [redacted]
- EDI Format - ENMRG (ENMRG) — Email — [redacted]
- EDI Format - ESDAT (ESDAT) — Email — [redacted]
- EDI Format - XTab (XTAB) — Email — [redacted]
- Electronic SRN for ESdat (ESRN_ESDAT) — Email — [redacted]

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com

BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com

GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com

MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com

MELBOURNE 2-4 Westall 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.mail@alsglobal.com

NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com

NOWRA 4/19 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com

PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com

Environmental Division Brisbane

Work Order Reference

EB1710666

Telephone : +61-7-3243 7222

CLIENT: GHD Pty Ltd	TURNAROUND REQUIREMENTS: ☑ Standard TAT (List due date):		FOR LABOR
OFFICE: Brisbane	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):		Custody Seal I
PROJECT: ASA	ALS QUOTE NO.: GHD national quote 2016 /2017.	COC SEQUENCE NUMBER (Circle) COC: (1) 2 3 4 5 6 7	Free Ice / Broke
ORDER NUMBER: 3134249		OF: 1 (2) 3 4 5 6 7	Random Samp
PROJECT MANAGER: [redacted]	CONTACT PH: [redacted]		Other commen
SAMPLER: [redacted]	SAMPLER MOBILE: [redacted]	RELINQUISHED BY: [redacted] DATE/TIME: 24/5/17	RECEIVED BY: DAN DATE/TIME: 25/5/17 8:05
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default): Esdat		RELINQUISHED B DATE/TIME:
Email Reports to (will default to PM if no other addresses are listed):	[redacted]		
Email Invoice to (will default to PM if no other addresses are listed):	[redacted]		

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 Full Suite	Major Ions, alkalinity	Total Dissolved Solids					
1	GW01	22/5/17	W		2	✓	✓	✓					
2	GW02	22/5/17	W			✓	✓	✓					
3	GW03	22/5/17	W			✓	✓	✓					
4	GW04	23/5/17	W			✓	✓	✓					
5	GW05	23/5/17	W			✓	✓	✓					
6	GW06	23/5/17	W			✓	✓	✓					
7	GW07	23/5/17	W			✓	✓	✓					
8	EW03	22/5/17	W			✓	✓	✓					
9	QA-01	22/5/17	W			✓	✓	✓					
	QA-02	23/5/17	W			✓	✓	✓					→ Forward to Eurofins M&T
10	SW01	23/5/17	W			✓	✓	✓					
11	SW02	23/5/17	W			✓	✓	✓					
				TOTAL									

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.

Appendix I – Calibration certificates

Oil / Water Interface Meter

Instrument Geotech Interface Meter (60m)
Serial No. 4103

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	9v
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	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: **Justin Cleary**

Calibration date: **16-May-17**

Next calibration due: **15-Jul-17**

AirMet Scientific P/L
7-11 Ceylon Street
Nunawading
Victoria 3131, Australia

Calibration Certificate

This document hereby certifies that this instrument detailed has been calibrated to the parameters listed below.

Certificate Print Date: 16 May, 2017
Calibration Date: 16 May, 2017
Next Calibration Due: 16 November, 2017

Call ID: **00206152**

Job / SO Number:

Customer: AMS BRISBANE RENTAL
Type: Water Meter
Model: WATERMETER
Serial No: 11K100830
Description: YSI Pro Plus

Sensor	Serial No	Standard Solutions	Certified	Solution # (Bottle #)	Instrument Reading	Units
Temp				Testo Mini	21.4	Degrees
Dissolved Oxygen				2920	0.1	%
Ph				ND2194	7.00	Ph
Ph				28770	4.00	Ph
EC				292705	2574	ms
Redox				OC1144/OC1145	236.6	mV

Completed by: *Justin Cleary*
Signed:

Australian Standard Alarm Levels ☐

Appendix J – Waste docket

CLEANAWAY

5389556

Service Dkt # 296862

NQ Resource Recovery Pty Ltd ABN 74 057 294 265

TOWNSVILLE (Regional Office): Ph: 4774 7333 Fax: 4774 7099 • PO Box 7948, Garbutt, Q 4814
CAIRNS: Ph: 4019 6600 Fax: 4033 6745 • PO Box 225, Stratford, Q 4870
MT ISA: Ph: 4774 7333 Fax: 4774 7099 • PO Box 7948, Garbutt, Q 4814
MACKAY: Ph: 4829 3100 Fax: 4952 4511 • PO Box 5264 MC, Mackay, Q 4741

DATE: 14 / 6 / 2017

CLIENT ORDER#: 183715 ACCOUNT #:

CLIENT: GHD - Cairns Airport

POSTAL ADDRESS: General Aviation
Cairns Airport

COLLECTION / DELIVERY
SERVICE ADDRESS:

	QUANTITY	
☐ Oil Collection		
☐ Oily Water Collection		14 x 20L Pails
☐ Sludge Collection		
☐ Greasetrap Collection		
☐ Septic Collection		
☐ Dirty Water Collection		
☐ Fuel Delivery Type of Fuel		
☐		
☐		
☐		
☐		
☐		

	Time IN	Time OUT	TRAVEL Time
☐ Truck Hire Time			

☐ Call Out Rate ( ) @ /hour

Driver — Customer's Signature Nyh.

Unit # 148 Please Print Name B. Lynch.

60051I011216

Waste Transport Certificate

Queensland Government

Q 01289182

Part 1

This section is to be completed by the Generator or Storer of waste

Name, Description and Chemical Composition of the Waste

U.N. Class | Subsid Risk | U.N. Number | Bulk/No of Packaging | Type of Packaging | Packaging Grp

Amount of Waste | Physical Nature | Waste Code No

○ Litres ○ Cubic Metres ◉ Kilograms

Name of Waste Generator

Address where waste was generated

Postcode

Contact Name | Phone No. | ABN/ACN

Environmental Authority No (if applicable) | Local Government Area

Nominated Disposal/Treatment/Storage Facility

Name of Transporter Company

Address

Postcode

Vehicle No 1 Rego No. | Vehicle No/Trailer Rego No. | ABN/ACN

Environmental Authority No. | Environmental Authority No. | Mode of Transport: ☐ Road ☐ Rail ☐ Air ☐ Sea

I declare that to the best of my knowledge and belief the above information is true and correct (Name and Position) ELLIOT LYNCH

If applicable I am acting as an agent for the Receiver ☐

Signature

Date

Part 2

To be completed by the Waste Transporter

I acknowledge the receipt of the waste described in part 1. Discrepency: ☐ Waste Type ☐ Volume received ☐ Other

If applicable I am acting as an agent for: ☐ Generator ☐ Receiver

Name | Phone No.

Signature

Date

Part 3

To be completed by the Facility Receiving Waste

Name of Receiving Facility

Address

Postcode

ABN/ACN | Disposal/Treatment Code | Physical Nature | Waste Code No

Discrepancy: ☐ Waste Type ☑ Volume Received ☐ Transporter Details ☐ Other

Environmental Authority No. | Amount of Waste

○ Litres ○ Cubic Metres ◉ Kilograms

If applicable I am acting as an agent for the Generator ☐

I acknowledge the receipt of the waste described in part 1.
(Name and Position)

Phone No.

Signature

Date

WHITE COPY - TO BE FORWARDED TO EHP BY RECEIVER
PINK COPY - TO BE FORWARDED TO EHP WITH PARTS 1 & 2 COMPLETED, BY THE PERSON/COMPANY WHO COMPLETED PART 1
GREEN COPY - TO BE RETAINED BY THE PERSON/COMPANY WHO COMPLETED PART 1
YELLOW COPY - TO BE RETAINED BY THE PERSON/COMPANY WHO COMPLETED PART 3
BLUE COPY - TO BE RETAINED BY THE WASTE TRANSPORTER

PLEASE FORWARD EHP COPIES (WITHIN 7 DAYS) TO WASTE TRACKING, GPO BOX 2454, BRISBANE, QLD 4001.

Pollution Hotline No. 1300 130 372

GHD

180 Lonsdale Street
Melbourne, Victoria 3000
T: (03) 8687 8000 F: (03) 8687 8111 E: melmail@ghd.com.au

G:\31\34249\WP\Prelim Sampling Reports\257114.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

www.ghd.com